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KENTUCKY
REPORT TO CONGRESS
ON
WATER QUALITY

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES and
ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

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EXECUTIVE SUMMARY

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This report was prepared to fulfill requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 82-500) as amended by the Water Quality Act of 1987 (P.L. 100-4). Section 305(b) requires that states submit a report to the U.S. Environmental Protection Agency on a biennial basis which assesses current water quality conditions. Topics that are discussed in the report are groundwater quality, the status of the state water pollution control program, water quality conditions and use support of streams, rivers and lakes, a discussion on wetlands, and recommendations on additional actions necessary to achieve the objectives and goals of the Clean Water Act.

Water Quality Assessment

The water quality assessment of rivers and streams in Kentucky's 1990 report is based on those waters depicted on the 1974 U.S. Geological Survey Hydrologic Unit Map of the state. The map contains about 18,500 miles of streams, of which approximately 10,200 miles (55%) were assessed. This is an increase in coverage from the last report.

The assessment is based on an analysis of the support of classified uses. Warmwater aquatic habitat and primary contact recreation uses were most commonly assessed. Full support of uses occurred in 6,630 miles (65%) of the assessed waters and uses were not supported in 1,978.3 (19%). Partial use impairment was found in 1,612.7 miles (16%) miles of the assessed waters. The major causes of use nonsupport were fecal coliform contamination, which affected primary contact recreation use, and organic enrichment and siltation, which impaired warmwater aquatic habitat use. The major sources of the fecal coliform contamination were municipal wastewater treatment plant discharges and agricultural nonpoint sources. Municipal point sources were responsible for the organic enrichment, while surface mining and agricultural nonpoint sources were the major sources of siltation.

A statistical trend analysis showed improvements in water quality, particularly an increase in dissolved oxygen in South Elkhorn Creek, which was attributed to increased treatment of wastewater at the City of Lexington's Town Branch wastewater treatment plant. A trend in the Nolin River showed a deterioration in water quality which may be the result of the City of Elizabethtown's municipal discharges into Valley Creek, a tributary of the Nolin River.

Several trends were detected statewide, although specific causes were not readily apparent. Chloride increased at 14 of the 47 sites tested. The pH is increasing at many sites and decreasing at none. Total recoverable lead is decreasing at 16 sites and increasing at three sites.

Degradation due to priority pollutants has occurred in some of the state's streams. Fish consumption warnings remain posted for the Mud River and Town Branch in Logan, Butler, and Muhlenberg counties because of the presence of PCBs. A fish consumption advisory is also still in effect for the West Fork of Drakes Creek in Simpson and Warren counties, because of PCBs. These two sites were reported in the last 305(b) Report. Two new advisories have been issued since that report was published. Little Bayou Creek in McCracken County and four locations on the Ohio River were posted with advisories because of PCB contamination. Chlordane contaminated fish were also found at three of the Ohio River areas. The Ohio River advisories are for the consumption of particular species only (catfish at two areas, catfish, carp and white bass at one, and catfish and white bass at the other).

Section 304(l) of the 1987 amendments to the Clean Water Act requires states to focus attention on waters impaired by toxic pollutants. Three lists: a "short list" of waters affected by point source toxic pollutants; a "mini list" of waters affected by point and nonpoint sources of pollutants; and a "long list" of waters affected by all types of pollutants from all sources were prepared in response to this requirement. An update of the short and mini lists is presented in this report. The short list contains 20 stream segments where individual control strategies for point source dischargers of toxic pollutants were developed. Individual control strategies for these segments are Kentucky Pollutant Discharge Elimination System permits containing appropriate numeric effluent limitations.

Forty-two fish kills totalling over 541,000 fish were reported in the past two years, affecting over 153 miles of streams. The number of fish kills reported and the number of waterbodies affected were lower than those reported over the last ten years, but the number of miles affected and the number of fish killed were higher. Fish kills were most commonly attributed to sewage discharges. Bacteriological surveys were conducted on seven stream drainages. Municipal sewage treatment plant discharges were found to be a major source of recreational use impairment.

The water quality assessment of lakes included more than 90 percent of the publicly owned lake acreage in Kentucky. Sixty-two of 99 lakes fully supported their uses. On an acreage basis, 91 percent (195,749 acres) of the 214,861 assessed acres fully supported uses.

Nutrients were the greatest cause of the uses not being fully supported and affected the largest number of lakes. Nonpoint sources including agriculture, and municipal discharges, were the principal sources of the nutrients. Iron and manganese were the second greatest cause of use nonsupport, and affected domestic water supply uses. Natural release of these metals from bottom sediments into the water column causes water treatment problems.

An analysis of lake trophic status indicated that of the 99 lakes assessed, 56 were eutrophic, 31 were mesotrophic and 12 were oligotrophic. McNeely Lake showed an improvement in water quality. Reformatory, Green River, Spurlington, Campbellsville City, Jericho, and Doe Run lakes became more eutrophic than previously reported. Lake Jericho was added to the list of lakes which did not support their uses. A lake restoration effort that involves liming is being undertaken at Cranks Creek Lake to offset the effects of acid mine drainage. This should change its status from partial support to full support.

Underground storage tanks, septic tanks, abandoned hazardous waste sites, improper well construction, and oil and gas brine pits are estimated to be the top five sources of groundwater contamination in Kentucky. Lack of basic monitoring data prevents an assessment of the magnitude of the problem caused by these sources. Pilot well head protection studies have been initiated to gain experience in methods to detect and evaluate contamination of groundwater.

Protecting public water supplies dependent upon groundwater and lack of consistent data gathering in a useable format by agencies involved in groundwater monitoring, are two of the areas of special concern in the groundwater program. Contamination from oil and gas exploration is another.

Water Pollution Control Programs

Kentucky's water pollution control programs continued expanding to develop new approaches for controlling pollution. By the end of 1989, 66 municipal and 35 industrial wastewater treatment facilities had requirements for biomonitoring. The Division of Water conducted acute and chronic toxicity tests on 54 point source discharges and on instream locations above and below those sources. Pretreatment programs have been approved in 64 cities to better treat industrial wastes. A state revolving fund program has been approved to meet the needs of new wastewater treatment plant construction.

Forty-five primary ambient monitoring stations, which characterized approximately 1,500 stream miles within the state, were in operation during the reporting period. Biological monitoring has occurred at 40 of these stations since 1986. In addition, ten lakes were sampled for eutrophication trends and three lakes for acid precipitation trends. An expanded lake assessment project has been funded by the federal Clean Lakes Program which allowed 34 additional lakes to be sampled for eutrophication trends. Nine intensive surveys were conducted on 763 miles of streams for the evaluation of municipal point source and nonpoint agricultural pollution, oil production effects on water quality, and for assessing recreational use attainability. The survey of the Little River revealed that a large portion of the watershed was being impacted by agricultural activities that caused the warmwater aquatic life use to be only partially supported. Yellow Creek, near Middlesboro, was found to have improved water quality because of better municipal wastewater treatment.

WATER WATCH, a citizen's education program, expanded its membership and more than doubled the number of waters "adopted" by local groups. Since its beginning, 270 groups have been established and 250 streams, 25 lakes, 30 wetlands, and nine karst or underground systems have been adopted. A water quality monitoring project has produced data on stream water quality at 89 sites across the state.

The nonpoint source control program has been involved in monitoring projects in the Mammoth Cave area (Turnhole Spring Groundwater Basin), the upper Salt River/Taylorsville Lake watershed, and the upper Green River watershed. These are recently initiated long term studies aimed at determining nonpoint source impacts and demonstrating water quality improvements from best management practices.

A Nonpoint Source Advisory Committee was formed to help identify new directions for the nonpoint source management program. The program received full approval from the U.S. Environmental Protection Agency in 1989.

An update of the Nonpoint Source Pollution Assessment Report was produced for this report. Streams, rivers, lakes, wetlands and groundwater impacted by nonpoint sources of pollution are listed in an Appendix, along with current information regarding sources and parameters of concern.

BACKGROUND

BACKGROUND

This report was prepared to fulfill the requirements of Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500) as amended by the Clean Water Act of 1987 (P.L. 100-4). Section 305(b) requires that states submit a report to the U.S. Environmental Protection Agency (EPA) every two years which addresses current water quality conditions. Items to be addressed in the report include an assessment of the degree to which nonpoint sources of pollutants affect water quality, an assessment of state groundwater quality, an assessment of the extent to which the state's waters meet their designated uses and the fishable/swimmable goals of the Act, and recommendations on additional actions necessary to achieve the water quality objectives of the Act. Specific data on lake water quality, and information on state programs is also required and addressed in the report. EPA uses the reports from the states to apprise Congress of the current water quality of the Nation's waters and recommend actions which are necessary to achieve improved water quality. States use the reports to provide information on water quality conditions to the general public and other interested parties, and to help set agency pollution control directions.

This report follows the guidance document that EPA provided to the states for the 1990 report. The stream water quality in this report is based on those streams shown on the U.S. Geological Survey's (USGS) Hydrologic Unit Map of Kentucky (scale 1:500,000). The assessments were based on this map's approximately 1,300 streams and rivers which contain about 18,500 stream miles. Stream miles were determined by chord lengths to the 0.1 mile, on USGS 7.5 minute quadrangle maps (scale 1: 24,000). These maps are the official river mile index maps maintained by the Division of Water. Stream miles not measured by this method were determined by using map wheels. Kentucky is divided into 42 cataloging units, which compose the 12 river basins assessed in this report. These drainage basins from east to west are the Big Sandy, Little Sandy, Tygarts, Licking, Kentucky, Upper Cumberland, Salt, Green, Tradewater, Lower Cumberland, Tennessee, and Mississippi. The Ohio River Valley Water Sanitation Commission (ORSANCO) compiles a report on the Ohio River which is used as a supplement to the 305(b) reports submitted by the member states of the Commission. The assessment of lake conditions is based on data collected by the Division of Water in 1981-1983 and updated in 1989 through a lake assessment project funded under the federal Clean Lakes Program. The 99 lakes which were assessed have a total area of 214,861 acres and comprise over 90 percent of the publicly owned lakes in the state. This includes the Kentucky portions of Barkley, Kentucky and Dale Hollow lakes which are border lakes with Tennessee. Total wetland acreage in Kentucky has not been accurately determined. The Division of Water, in collaboration with the Kentucky Department of Fish and Wildlife Resources, has contracted with the U.S. Fish and Wildlife Service to map wetlands in the Commonwealth.

Kentucky's population, according to the 1980 census, is 3,660,257. The state has an approximate area of 40,598 square miles. It is estimated that there are approximately 89,431 miles of streams within the borders of Kentucky. That figure was determined from the Kentucky Natural Resources Information System, which has a computerized geographic database. All of the blue line streams on the 7.5 minute USGS topographic maps were digitized to produce the figure. Main channel and tributary river miles in reservoirs are included. A project is underway to subtract those miles, which will produce a more accurate river and stream mile total. Kentucky has 849 miles of border rivers. The northern boundary of Kentucky is formed by the low water mark of the northern shore of the Ohio River and extends along the river from Catlettsburg, Kentucky in the east to the Ohio's confluence with the Mississippi River near Wickliffe in the west (a length of 664 miles). The southern boundary is formed by an extension of the Virginia-North Carolina 1780 Walker Line which extends due west to the Tennessee River. Following the acquisition of the Jackson Purchase in 1818, the 36°30' parallel was accepted as the southern boundary from the Tennessee River to the Mississippi River.

Kentucky's eastern boundary begins at the confluence of the Big Sandy River with the Ohio River at Catlettsburg and follows the main stem of the Big Sandy and Tug Fork southeasterly to Pine Mountain, for a combined length of 121 miles; then follows the ridge of the Pine and Cumberland mountains southwest to the Tennessee line. The western boundary follows the middle of the Mississippi River for a length of 64 miles and includes several of the islands in the Mississippi channel. A listing of the above information is provided below.

Atlas

State population (1980 census)	3,660,257
State surface area (square miles)	40,598
Number of major river basins	12
Number of river miles*	89,431
Number of river border miles (subset)	849
Number of lakes/reservoirs	Unknown
Number assessed	99
Acres of lakes/reservoirs	Unknown
Acres assessed	214,861
Wetland acres	Unknown

*includes reservoir main channel and tributary channel miles

The climate of Kentucky is classified as continental temperate humid. Summers are warm and humid with an average temperature of 76°F, while winters are moderately cold with an average temperature of 34°F. Annual precipitation averages about 45 inches, but varies between 40 to 50 inches across the state. Maximum precipitation occurs during winter and spring with minimum precipitation occurring in late summer and fall.

Summary of Classified Uses

Kentucky lists waterbodies according to specific uses in its water quality standards regulations. These uses are: 1) Warmwater Aquatic Habitat, 2) Coldwater Aquatic Habitat, 3) Domestic Water Supply, 4) Primary Contact Recreation, 5) Secondary Contact Recreation and 6) Outstanding Resource Waters. Those waters not specifically listed are classified (by default) for use as warmwater aquatic habitat, primary and secondary contact recreation, and domestic water supply. The domestic water supply use is applicable at points of public and semipublic water supply withdrawal. Lakes have not been listed in the current regulations and are classified for the default uses. Proposed changes to the water quality standards regulations classify major lakes by use, but are not yet formally adopted. The Division of Water adds waterbodies to the classified lists as an ongoing process in its revision of water quality standards. Intensive survey data and data from other studies when applicable are used to determine appropriate uses. Currently, 1,683 stream miles are classified as warmwater aquatic habitat, 384.4 miles as coldwater aquatic habitat, and 206.7 miles as outstanding resource waters. There are approximately 104 points where domestic water supply is withdrawn in streams, and 54 lakes used for domestic water supply purposes.

CHAPTER 1

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

WATER QUALITY ASSESSMENT OF RIVERS AND STREAMS

Status

Water quality conditions for rivers and streams in Kentucky are summarized by use support status in Table 1. The table indicates that of the 10,221 miles assessed, approximately 35 percent experienced some degree of use impairment, while 65 percent fully supported uses. Approximately 55 percent of the river miles on the USGS hydrologic unit maps were assessed. This is an increase from stream miles assessed in the 1988 305(b) Report. Corrections on stream lengths were made for this report, so the increase cannot be easily quantified.

Table 1

Designated Use Support by River Basin

Basin	Total Miles	Miles Assessed	Miles Fully Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses
Big Sandy	1133.5	576.2	300.3	47.3	228.6
Little Sandy	356.7	174.3	65.4	31.1	77.8
Tygarts Creek	194.9	193.4	147.9	0.0	45.5
Licking	2,053.1	1037.9	820.1	46.1	171.7
Kentucky	3,416.0	1,698.5	1,143.7	231.5	323.3
Upper Cumberland	2,146.7	992.4	683.9	220.9	87.6
Salt	1,193.4	1,026.2	641.1	87.6	297.5
Green	3,549.4	2,154.5	1,624.0	220.2	310.3
Tradewater	529.2	360.8	151.0	125.7	84.1
Lower Cumberland	648.8	462.1	333.6	107.5	21.0
Tennessee	359.1	128.1	87.1	21.5	19.5
Mississippi	489.4	196.0	142.4	53.6	0.0
Ohio (Minor tribs)	1,756.2	556.7	419.0	74.8	62.9
Ohio (Mainstem)*	663.9	663.9	70.5	344.9	248.5
STATE TOTAL	18,490.3	10,221.0	6,630	1,612.7	1,978.3

*Assessment provided in 1990 ORSANCO 305(b) Report.

Methods of Assessment

Water quality data collected by the Kentucky Division of Water (DOW), Kentucky Division of Waste Management, Ohio River Valley Water Sanitation Commission (ORSANCO), U.S. Army Corps of Engineers, and the U.S. Geological Survey (USGS) were used to determine stream use support status. Other sources of information used in this determination include biological studies at fixed stations, intensive surveys, and data supplied by the Kentucky Department of Fish and Wildlife Resources. The data were categorized as "monitored" or "evaluated." Monitored data were derived from site specific ambient surveys and were generally no more than five years old. In some instances where watershed conditions remained unchanged, monitored data over five years old were still considered valid and were categorized as monitored. Evaluated data were from other sources or from ambient surveys which were conducted more than five years ago. The criteria for assessing this data to determine use support follow.

Water Quality Data

Chemical data collected by the DOW and the USGS at fixed stations were evaluated according to U.S. EPA guidelines for the preparation of this report. Water quality data collected during the period from October 1987 through September 1989 were compared with state and EPA standards and applied to the status criteria. A list of the parameters and their corresponding criteria are noted in Table 2. All of the criteria in the table, except fecal coliform, were used to assess warmwater aquatic habitat (WAH) use support. If none of the criteria were exceeded in $\leq$ 10 percent of the measurements and their means were less than the criteria, the segment fully supported its use for WAH. Partial support was indicated if any one criterion was exceeded 11-25 percent of the time and the mean was less than the criterion, or if any criterion was exceeded $\leq$10 percent of the time and its mean was greater than the criterion. The segment was not supporting if any criterion was exceeded >25 percent of the time, or the criterion was exceeded 11-15 percent of the time and the mean was greater than the criterion.

Fecal coliform data were used to indicate degree of support for primary contact recreation use. Primary contact support was evaluated using the methodology described above for the chemical data. In addition, streams with pH's below 6.0 units caused by acid mine drainage were judged to not support this use. Domestic water supply use was not assessed because the use is applicable at points of withdrawal only and could not be quantified in the format required by the guidelines. In areas where both chemical and biological data were available, the biological data were generally the determinate factor for establishing warmwater aquatic habitat use support status.

Fixed Station Biological Data

Biological data for 1985-1989 were collected from 40 fixed monitoring network stations in 12 drainage basins throughout the state. Algae, macroinvertebrates and fish were collected, and community structure metrics, including productivity, biomass, taxa richness, and relative abundance of taxa, were analyzed for each group of organisms. These metrics were used to determine biotic integrity, water quality and designated use support for each reach monitored. Expectations for metric values are dependent upon stream size, ecological region, and habitat quality, and were applied accordingly. Criteria for bioassessment of use support (Table 3) were based on these expectations. Bioassessments integrated data from each group of organisms, habitat data, known physical and chemical parameters, and professional judgement of aquatic biologists.

Algae Algal samples were collected from each biological monitoring station using standarized collection procedures. Plankton chlorophyll *a*, periphyton chlorophyll *a*, and periphyton ash-free dry-weight were measured at each site, and diatoms were identified to species and enumerated. Reaches are supporting the WAH use if diatom taxa richness is high, plankton and periphyton chlorophyll *a* and ash-free dry weight values are near average for the fixed monitoring stations, and the diatom community is

Table 2

Physical and Chemical Parameters and Criteria Used to Determine Use Support Status at Fixed-Stations

Parameter	Criterion	Source
Dissolved oxygen	<4.0 mg/l	KWQS[1]
Temperature	$30^{o}C$	KWQS
pH	6 to 9 units	KWQS
Un-ionized ammonia	0.05 mg/l	KWQS
Chloride	250 mg/l	KWQS
Arsenic	50 ug/l	KWQS
Cadmium	Based on hardness[2]	EPA[4]
Chromium	11 ug/l	EPA
Copper	Based on hardness[3]	EPA
Lead	Based on hardness[5]	EPA
Zinc	Based on hardness[6]	EPA
Fecal coliform	(May 1 thru Oct. 31) 400 colonies/100 ml	KWQS

1) Kentucky Water Quality Standards
2) Criterion = $e^{(.785 \ln x - 3.49)}$ x = hardness in mg/l as $CaCO_3$
3) Criterion = $e^{(.85 \ln x - 1.465)}$ x = hardness in mg/l as $CaCO_3$
4) U.S. Environmental Protection Agency
5) Criterion = $e^{(1.27 \ln x - 4.7)}$ x = hardness in mg/l as $CaCO_3$
6) Criterion = $e^{(.847 \ln x + .76)}$ x = hardness in mg/l as $CaCO_3$

Table 3
Biological Criteria for Assessment of Warmwater Aquatic Habitat (WAH) Use Support

	Fully Supporting	Partially Supporting	Not Supporting
Algae	Taxa richness (TR) high, intolerant taxa present, community similarity to reference site ≥50%, biomass (chlorophyll a, AFDW*, cell density) similar to reference/control or STORET mean.	Reduced number and Relative Abundance (RA) of intolerant taxa, community similarity lower than 50%, increased number or RA of pollution tolerant taxa, increased biomass (if nutrient enriched) of filamentous green algae.	Low TR, loss of intolerant species, pollution tolerant taxa dominant, low community similarity to reference sites, biomass very low (toxicity) or high (organic enrichment).
Macroinvertebrates	Taxa richness, and EPT* index high, community similarity to reference site >50%, intolerant species present.	Taxa richness and/or EPT lower than expected, community similarity <50%, increased RA or numbers of facultative taxa. Reduction in RA of intolerant taxa. Some alterations of functional groups evident.	Taxa richness and EPT low, community similarity low, facultative or pollution tolerant taxa dominant, TNI* of tolerant taxa very high. Most functional groups missing from community.
Fish	Index of Biotic Integrity (IBI) excellent or good, presence of rare, endangered or species of special concern.	IBI fair	IBI poor, very poor, or no fish.

*AFDW - Ashfree Dry Weight, EPT - Ephemeroptera, Plecoptera, Trichoptera, TNI - Total Number of Individuals dominated by species typical of a stream of that size within that ecoregion. Community similarity between these sites and reference or control sites is >50%. A reach partially supports uses if diatom taxa richness or community similarity to a reference site was low, or if tolerant species abundances are higher than expected. A reach does not support uses if toxic or organic enrichment is indicated by extremely low or high biomass, or if the diatom community is dominated by pollution tolerant species. Expectations for these values are based on average values for sites of similar physical and habitat characteristics, or values derived from the same site at a previous time.

Macroinvertebrates Macroinvertebrates were collected using both artificial substrates and qualitative collections from all available natural substrate habitats. For the macroinvertebrate evaluations, stream reaches are considered to fully support the WAH use if information reflects no alterations in community structure or functional compositions for the available habitats, and if habitat conditions are relatively undisturbed. A reach is considered partially supporting uses when information reveals that community structure is slightly altered, that functional feeding components are noticeably influenced, or if available habitats reflect some alterations and/or reductions. Reaches are considered not supporting uses if information reflects sustained alterations or deletions in community structure, taxa richness and functional feeding types, or if available habitats are severely reduced or eliminated.

Fish Fish were collected for community structure evaluation at selected biological monitoring sites. The condition of the fish community was determined by analysis of relative abundance, species richness and species composition, and the use of an Index of Biotic Integrity (IBI). The IBI was used to assess biotic integrity directly by evaluation of twelve attributes, or metrics, of fish communities in streams. These community metrics include measurement of species richness and composition, trophic structure, and fish abundance and condition. The IBI was used to assign one of the following categories to a fish community: excellent, good, fair, poor, very poor, or no fish. Reaches fully supporting uses have an IBI of excellent or good, reaches partially supporting uses have an IBI of fair, and reaches not supporting uses have an IBI of poor, very poor, or no fish.

Intensive Survey Data

In the 1988-1989 biennium, nine intensive surveys were conducted to determine if target streams were supporting their designated uses. Data were also evaluated for 36 additional surveys conducted between 1982 and 1987. Streams intensively surveyed more than five years ago are considered as "evaluated waters", whereas streams surveyed more recently are "monitored waters".

The streams were assessed by evaluating the biological communities (refer to Table 3), physicochemical, toxicity, and habitat data, as well as known watershed activities in concert with direct observation and professional judgement. Stream mileages were grouped as supporting, partially supporting, or nonsupporting designated uses. Streams are considered to support designated uses if no impacts, or only minor impacts to the biotic integrity, physical habitat, and water quality are observed. Streams are determined to be partially supporting when the data indicate either stressed biotic communities, minor violations of water quality criteria, or some physical impairment to aquatic habitats. Nonsupporting streams are those showing severe stress, such as sustained species deletions, trophic imbalances in the biotic communities, chronic violations of water quality criteria, and severely impaired aquatic habitats.

Kentucky Department of Fish and Wildlife Resources Data

The Division of Water extended its analysis of stream use support by developing questionnaires on unmonitored streams and sending them to Conservation Officers of the Kentucky Department of Fish and Wildlife Resources (KDFWR). The questionnaire results were utilized in the evaluated category of assessed waters. Sixty-six of 120 questionnaires were returned, a response of slightly over 50 percent.

Each questionnaire was divided into two sections. A habitat evaluation section included questions on major land uses in the stream basin, flow, bottom type, sedimentation, and water quality. If water quality was stated to be less than good, the respondent was asked to indicate why a fair or poor evaluation was given.

Fisheries support was evaluated through questions regarding stream fishery characterization, reproduction (as indicated by presence or absence of both young-of-year (y-o-y) and adult sport fishes), fishery success, and trend of the fishery over the last 10 years. If the fishery was felt to be poor, the respondent was asked to indicate why.

In this evaluation of use support, only those questionnaire responses indicating definite support or nonsupport were used. Partial support was not assessed. A stream was considered to fully support WAH use if:

(1) the stream supported a good fishery,
(2) both y-o-y and adult sport fishes were present, or if only y-o-y were present, the stream was a tributary to a stream supporting the WAH use, and
(3) water quality was judged good.

A stream did not support the WAH use if:

(1) the stream supported a poor fishery,
(2) few or no fish were present in the stream, and
(3) water quality was judged poor and/or repeated fish kills were known to occur.

The questionnaires proved useful in evaluating the support or nonsupport of use in streams. The concept of utilizing sport fishery information was adopted from the Illinois 1986 305(b) report. While the questionnaire was somewhat rudimentary, it was useful and helped to increase the number of assessed streams in the state.

Another source of data for the evaluated category was a list of streams recommended by the KDFWR as candidates for State Outstanding Resource Waters. They were recommended because of their outstanding value as sport fishing streams. These streams were assessed as fully supporting warmwater aquatic habitat use if there was no data which conflicted with the assessment.

Other Data Sources

The classification of streams as coldwater aquatic habitats (CAH) in Kentucky's water quality standards regulations are established from data provided by the KDFWR. Their field surveys indicate which streams can support a sustainable year around trout fishery. These streams were considered to fully support their CAH use and were considered as monitored waters in the assessment.

Recent field work, conducted for the U.S. Fish and Wildlife Service, identified streams in Kentucky which harbored the blackside dace, a federally endangered species of fish. This work was considered as monitored data. These streams are automatically classified as State Outstanding Resource Waters and were judged to fully support the WAH use.

Streams surveyed by the Kentucky State Nature Preserves Commission for a special project to obtain background aquatic biota and water quality data in the oil shale region of the state were utilized as "monitored" information in this report. The information was published in a 1984 report entitled Aquatic Biota and Water Quality and Quantity Survey of the Kentucky Oil Shale Region.

An announcement was placed in the Newsletter of the Kentucky Academy of Science (KAS) which requested that current academic or other published reports on biological data from streams in the state be sent to the DOW for use assessment purposes. Two reports were received and both were utilized in the assessment. This approach will be tried again for the next 305(b) Report because KAS members could become a new source of biological data for many streams in the State.

Use Support Summary

Table 4 shows the results of the evaluated and monitored assessments on a statewide basis. The threatened category refers to stream miles which were judged to be in danger of use impairment from anticipated land use changes or development of trends indicating possible impairment.

Table 1 has more total assessed miles and more miles in the partial support category because it included conclusions from ORSANCO's assessment of the mainstem of the Ohio River and Missouri's assessment of the Mississippi River. Both tables follow EPA guidelines which define fully supporting as meaning that all uses which were assessed had to be fully supporting before a segment could be listed under that title. If a segment supported one use, but did not support another, it was listed as not supporting. For instance, if a segment supported a warmwater aquatic habitat use, but not a primary contact recreation use, it was listed as not supporting. A segment would be listed as partially supporting if any assessed use fell into that category even if another use was fully supported. Many streams were assessed for only one use because data were not available to assess other uses.

Causes of Use Nonsupport

Table 5 indicates the relative causes of use nonsupport. Stream segment lengths which either did not support or partially support uses were combined to indicate the miles that were affected. Fecal coliform bacteria (pathogen indicators) were the greatest cause of use impairment and affected primary contact use in 1,423 miles of streams and rivers. Organic enrichment/dissolved oxygen was the second greatest cause of use impairment. It impaired warmwater aquatic habitat use in 500 miles of streams and rivers and moderately impacted an additional 23 miles. Organic enrichment lowers dissolved oxygen in streams which causes stress on aquatic life. Siltation was the third greatest cause of use impairment. It impaired warmwater aquatic habitat use in 406 miles of streams. Siltation affects the use by covering available habitat, preventing aquatic organisms from inhabiting streams that could normally support them.

Table 4

Summary of Assessed* Use Support

Degree of Use Support	Assessment Basis Evaluated	Monitored	Total Assessed
Miles Fully Supporting	4,375.2	2,054.4	6,429.6
Miles Fully Supporting but Threatened	6.7	123.2	129.9
Miles Partially Supporting	361.0	906.8	1,267.8
Miles Not Supporting	480.4	1,249.4	1,729.8
TOTAL	5,223.3	4,333.8	9,557.1

*Excludes mainstems of Ohio and Mississippi rivers; refer to ORSANCO and Missouri 305(b) Reports for assessments.

Sources of Use Nonsupport

Sources of use nonsupport were assessed under point and nonpoint categories and are listed in Table 6. Nonpoint sources as a whole affected about twice as many miles of streams as point sources. Municipal point sources and agriculture nonpoint sources were the leading sources of use nonsupport, each affecting over 1,000 miles of streams. Primary contact recreation was the major use impaired by municipal sources and was caused by fecal coliform pollution. Agriculture affected warmwater aquatic habitat use because of siltation and primary contact recreation use because of fecal coliform contamination.

Table 5
Causes of Use Nonsupport in Rivers and Streams

Cause Category	Miles Affected: Major Impact	Miles Affected: Moderate/Minor Impact
Pathogen indicators	1423.5	0
Organic enrichment/D.O.	500.4	23.4
Siltation	406.1	18.3
pH	261.2	13.3
Metals	249.4	146.4
Nutrients	222.0	32.1
Salinity/TDS/Chlorides	164.0	20.1
Priority organics	124.8	0
Unknown toxicity	109.5	13.0
Other habitat alterations	98.2	54.8
Oil and grease	37.3	0
Suspended solids	35.0	0

Table 6
Sources of Use Nonsupport in Rivers and Streams

Source Category	Miles Affected: Major Impact	Miles Affected: Moderate/Minor Impact
Point Sources		
Municipal	1151.3	25.4
Industrial	182.5	29.7
Combined sewer overflows	0	0
TOTAL	1333.8	55.1
Nonpoint Sources		
Agriculture	1046.2	184.7
Resource Extraction	833.4	34.3
Urban runoff/Storm sewers	218.7	41.6
Hydro-Habitat modification	153.0	0
Land disposal/Septic tanks	74.9	49.5
Construction	2.5	0
TOTAL	2328.7	310.1
Unknown	204.3	0

Rivers and Streams Not Fully Supporting Uses

Table 7 lists streams and rivers which did not fully support warm water aquatic habitat (denoted as aquatic life) and primary contact recreation (denoted as recreation) uses. Stream miles affected and causes and sources of nonsupport are also listed.

Attainment of Clean Water Act Goals

The Clean Water Act sets a national goal that, wherever attainable, water quality should provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the nation's waters. These are often referred to as the fishable/swimmable goals of the Act. The data utilized to assess use support were evaluated in terms of the above goals. If warmwater aquatic habitat use was fully or partially supported, the fishable goal was assessed as fully or partially met. If a stream was not supporting the use, the fishable goal was not met. If the primary contact recreation use was supported or partially supported, then the swimmable goal was fully or partially met. If the use was not supported, the goal was not met. Table 8 summarizes the attainment of the fishable/swimmable goals for Kentucky's rivers and streams. The fishable goal was met in more of the assessed waters than the swimmable goal. The swimmable goal was not met in about 60 percent of the assessed waters. As pointed out in the previous discussion, fecal coliform pollution is the major cause of this goal not being achieved. There is a difference in miles assessed for these goals because more biological data was available to assess the fishable goal than was bacteriological data to assess the swimmable goal.

Table 8

Attainment of Clean Water Act Goals in Rivers and Streams

Goal Attainment	Fishable Goal	Swimmable Goal
Miles meeting	6,913.6	1,481.2
Miles partially meeting	1,701.8	575.9
Miles not meeting	722.9	1,537.6
Miles assesseed	9,338.3	3,594.7

Table 7
List of Streams Not Fully Supporting Uses by River Basin

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
<u>Big Sandy River Basin</u>						
Tug Fork	26.0	Siltation	Mining	55.4	Pathogens	Municipal/Ag
Knox Creek				7.6	Pathogens	Agriculture
Big Creek	19.7	Siltation	Ag/Mining			
Russell Fork				6.0	Pathogens	Municipal/Ag
Elkhorn Creek				27.4	Pathogens	Municipal
Shelby Creek				10.0	Pathogens	Municipal
Levisa Fork	48.0	Siltation/Organic enrichment	Ag/Mining/ Municipal	48.0	Pathogens	Municipal/Ag
Mud Creek	17.0	Siltation/Organic enrichment	Ag/Mining			
Left Fk. Middle Ck.	5.3	pH	Mining	5.3	pH	Mining
Paint Creek				1.0	Pathogens	Urban runoff
Big Sandy River	26.8	Metals	Mining			
Blaine Creek	34.2	Chlorides	Petroleum activities			

Table 7 (Continued)

Stream	Uses Not Supported: Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
<u>Little Sandy River Basin</u>						
Little Sandy River				51.0	Pathogens	Municipal/ Ag/Septic tanks
East Fk. Little Sandy River	31.1	Siltation	Ag/Mining			
Newcomb Creek	12.0	Chlorides	Petroleum activities			
Tygarts Creek				45.5	Pathogens	Municipal
<u>Licking River Basin</u>						
North Fk. Licking River				19.5	Pathogens	Agriculture
Licking River	6.4	Chlorides/Organic enrichment	Petroleum activities/ Municipal	43.6	Pathogens	Municipal/Ag
Burning Fork	7.5	Chlorides	Petroleum activities			
Rockhouse Fork	3.0	Chlorides	Petroleum activities			
State Road Fork	5.1	Chlorides	Petroleum activities			

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Lick Creek	9.2	Chlorides	Petroleum activities			
Raccoon Creek	5.2	Chlorides	Petroleum activities			
South Fk. Licking River	16.0	Nutrients/ Siltation	Ag/Urban runoff	20.0	Pathogens	Municipal/Ag/ Urban runoff
Hinkston Creek				19.8	Pathogens	Municipal/Ag
Indian Creek				0.6	Pathogens	Municipal
Big Brushy Fork	4.7	Chlorides/Nutrients	Agriculture			
Brushy Fork Creek	1.4	Chlorides/Nutrients	Industrial			
U.T. to Brushy Fork	2.8	Chlorides/Nutrients	Industrial			
Houston Creek				19.0	Pathogens	Agriculture
Hancock Creek				7.6	Pathogens	Agriculture
Strodes Creek				24.0	Pathogens	Municipal/Ag/ Urban runoff
Stoner Creek				9.6	Pathogens	Municipal/Ag

Table 7 (Continued)

Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
	Uses Not Supported					
Kentucky River Basin						
North Fk. Kentucky River	8.6	Siltation	Mining/Ag	46.1	Pathogens	Municipal/ Urban runoff
Lost Creek	18.5	Siltation	Mining			
Spring Fk. Quicksand Ck.	15.0	Siltation	Mining			
South Fk. Quicksand Ck.				13.8	Pathogens	Agriculture
Quicksand Creek				20.8	Pathogens	Agriculture
Troublesome Creek				49.5	Pathogens	Municipal/Septic tanks
Rockhouse Creek	24.3	Siltation	Mining			
Middle Fk. Kentucky River				43.2	Pathogens	Agriculture
Raccoon Creek	8.5	Oil & Grease/Siltation	Petroleum activities/ Mining			
Cutshin Creek	28.8	Oil & Grease/Siltation	Petroleum activities/ Mining			
Kentucky River (Heidelburg)				28.3	Pathogens	Municipal/Ag

Table 7 (Continued)

Stream	Uses Not Supported					
	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Kentucky River (Camp Nelson)				37.7	Pathogens	Unknown
Kentucky River (Frankfort)				30.1	Pathogens	Unknown
Red River	34.3	Siltation/Metals	Habitat damage/ Mining	10.1	Pathogens	Municipal
South Fk. Red River	11.8	Chlorides	Petroleum activities			
Sand Lick Fork	5.0	Chlorides	Petroleum activities			
Billey Fork	8.6	Chlorides	Petroleum activities			
Millers Creek	6.4	Chlorides	Petroleum activities			
Big Sinking Creek	14.1	Chlorides	Petroleum activities			
North Elkhorn Creek	2.0	Organic enrichment/ Chlorine/Nutrients	Municipal			
Cane Run	17.4	Unknown toxicity	Unknown			
South Elkhorn Creek	41.0	Organic enrichment/ Metals	Municipal	17.6	Pathogens	Municipal/ Urban runoff

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Town Branch	11.3	Organic enrichment/ Metals	Municipal	11.3	Pathogens	Municipal
Dix River				13.5	Pathogens	Municipal
Clarks Run	8.0	Organic enrichment/ Unknown toxicity	Municipal			
Silver Creek	2.0	Organic enrichment/ Nutrients	Municipal			
Walnut Meadow Branch	3.6	Organic enrichment/ Nutrients	Municipal			
Brushy Fork	0.2	Nutrients	Municipal			
<u>Upper Cumberland River Basin</u>						
Poor Fork Cumberland River	47.0	Siltation	Mining			
Cumberland River				75.1	Pathogens	Municipal/ Urban runoff/ Unknown
Marsh Creek	9.2	Siltation	Mining			
Clear Fk. Yellow Creek	8.7	Siltation	Mining			

Table 7 (Continued)

Stream	Uses Not Supported					
	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Stoney Fk. Yellow Creek	7.0	Siltation	Mining			
Bennetts Fk. Yellow Creek	6.3	Habitat damage/ Siltation	Mining			
Yellow Creek	5.5	Habitat damage/ Organic enrichment	Municipal/ Urban runoff			
Little Yellow Creek	2.5	Siltation	Construction			
Cranks Creek	13.3	Siltation/pH	Mining			
Crooked Creek	12.2	Siltation	Mining			
Cumberland River (Burkesville)				62.4	Pathogens	Unknown
Big Lily Creek	2.6	Chlorides	Industrial			
Elk Creek	1.5	Organic enrichment	Municipal			
Little South Fork	43.8	Siltation/Chlorides	Mining/Petroleum activities			
Rock Creek	4.0	Metals/pH	Mining	4.0	pH	Mining
Roaring Paunch Creek	15.6	Siltation/Chlorides	Mining/Petroleum activities			

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Salt River Basin						
Salt River	48.3	Organic enrichment/ Metals/Nutrients	Municipal/Ag/ Urban runoff	13.9	Pathogens	Municipal/Ag Urban runoff
Mill Creek	13.5	Organic enrichment	Municipal	13.5	Pathogens	Municipal
Long Lick Creek	12.4	Organic enrichment	Municipal			
Knob Creek	15.3	Unknown toxicity/ Organic enrichment	Municipal			
Brier Creek	6.5	Unknown toxicity/ Organic enrichment	Municipal			
Fishpool Creek	5.4	Unknown toxicity/ Organic enrichment	Municipal	5.4	Pathogens	Municipal
Pond Creek	29.8	Unknown toxicity/ Organic enrichment	Municipal	29.8	Pathogens	Municipal
Blue Lick Creek	6.0	Organic enrichment	Municipal			
Brooks Run	6.9	Organic enrichment	Municipal	6.9	Pathogens	Municipal
Cedar Creek	15.6	Organic enrichment	Municipal	15.6	Pathogens	Municipal
Pennsylvania Run	3.0	Organic enrichment	Municipal	3.0	Pathogens	Municipal

Table 7 (Continued)

Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
	Uses Not Supported					
Chenoweth Run	9.1	Organic enirchment	Municipal	9.1	Pathogens	Municipal
Cane Run	7.6	Organic enrichment	Municipal			
Long Run	14.6	Organic enrichment	Municipal			
Currys Fork	5.0	Organic enrichment	Municipal			
North Fork Currys Fork	7.6	Organic enrichment	Municipal			
Floyds Fork	48.5	Organic enrichment	Municipal	61.7	Pathogens	Municipal
Rolling Fork	~~20.1~~	~~Organic enrichment~~	~~Municipal~~	108.0 ~~[illegible]~~	Pathogens	Unban runoff/ Municipal
<u>Green River Basin</u>						
Green River	55.0	Metals	Unknown	107.6	Pathogens	Agriculture/ Urban runoff
Valley Creek	17.5	Organic enrichment/ Chlorides	Municipal/Urban runoff			
Bacon Creek				31.2	Pathogens	Agriculture
Nolin River				27.5	Pathogens	Municipal
Little Pitman Creek	10.0	Chlorides/Unknown toxicity	Municipal/Ag			

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Barren River	14.2	Metals	Urban runoff			
Black Lick Creek	11.2	Organic enrichment	Industrial/Municipal			
West Fk. Drakes Creek	23.4	Priority organics	Industrial			
Drakes Creek	23.5	Priority organics	Industrial			
Caney Creek	7.1	pH/Metals	Mining	7.1	pH	Mining
Pond Creek	28.8	pH/Metals	Mining	28.8	pH	Mining
Mud River	64.7	Priority organics	Industrial	34.2	Pathogens	Municipal
Town Branch	6.7	Priority organics	Industrial			
Panther Creek	22.5	Habitat damage/ Siltation	Channelization/Ag			
North Fk. Panther Creek	9.0	Habitat damage/ Siltation	Channelization/Ag			
South Fk. Panther Creek	10.0	Habitat damage/ Siltation	Channelization/Ag			
Pond River	52.6	Siltation/pH/Metals Nutrients/Habitat damage	Petroleum activities/ Ag/Unknown			

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
Flat Creek	10.6	pH	Mining	10.6	pH	Mining
Drakes Creek	21.3	pH	Mining	21.3	pH	Mining
Cypress Creek	33.3	pH	Mining	33.3	pH	Mining
Harris Creek	2.6	pH	Mining	2.6	pH	Mining
Tradewater River Basin						
28 Tradewater River	96.7	Organic enrichment/ Siltation/Metals	Mining/Ag			
Cypress Creek	10.0	pH/Siltation	Mining/Ag	10.0	pH	Mining
Smith Ditch	8.3	pH/Siltation	Mining/Ag	8.3	pH	Mining
Craborchard/Vaughn Ditch	18.8	pH/Siltation	Mining/Ag	18.8	pH	Mining
Clear Creek	28.1	pH/Siltation	Mining/Ag	28.1	pH	Mining
Buffalo Creek	7.8	pH/Siltation	Mining/Ag	7.8	pH	Mining
Cany Creek	11.3	pH/Siltation	Mining/Ag	1.3	pH	Mining
Lick Creek	18.1	pH/Siltation	Mining/Ag	18.1	pH	Mining
Weirs Creek	10.7	pH/Siltation	Mining/Ag	10.7	pH	Mining

Table 7 (Continued)

	Uses Not Supported					
Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
<u>Lower Cumberland River Basin</u>						
Little River	44.7	Siltation/Nutrients	Agriculture	37.4	Pathogens	Municipal
North Fk. Little River	15.9	Siltation/Nutrients	Ag/Municipal	14.0	Pathogens	Municipal/Ag
South Fk. Little River	25.4	Siltation/Nutrients	Ag/Industrial			
Sinking Fork Creek	35.5	Siltation/Nutrients	Agriculture			
Elk Fork Creek	7.0	Organic enrichment	Municipal/Ag			
<u>Tennessee River Basin</u>						
East Fk. Clarks River	21.5	Siltation/Nutrients/ Metals	Municipal/ Industrial/Ag	21.5	Pathogens	Municipal
Cypress Creek	19.5	Unknown toxicity/ Priority organics	Industrial			
<u>Mississippi River Basin</u>						
Mayfield Creek				31.8	Pathogens	Municipal/Ag
Bayou de Chien				21.8	Pathogens	Agriculture

Table 7 (Continued)

Stream	Aquatic Life (miles)	Cause	Source	Recreation (miles)	Cause	Source
	Uses Not Supported					
Ohio River Tributaries						
Harrods Creek	31.9	Organic enrichment	Municipal	31.9	Pathogens	Municipal
Little Goose Creek				8.7	Pathogens	Municipal
Goose Creek				12.1	Pathogens	Municipal
Muddy Fork				6.9	Pathogens	Municipal
Middle Fk. Beargrass Creek	2.5	Organic enrichment	Urban runoff	13.6	Pathogens	Urban runoff
South Fk. Beargrass Creek	15.0	Organic enrichment	Urban runoff	15.0	Pathogens	Urban runoff
Canoe Creek	14.8	Siltation/Habitat damage	Ag/Channelization			
Humphrey Creek	20.5	Siltation/Habitat damage	Agriculture			
Humphrey Branch	7.6	Unknown toxicity/ Siltation	Unknown/Ag			
Little Bayou Creek	6.5	Priority organics	Hazardous waste			

Trend Analysis

The Seasonal Kendall Trend Analysis technique was used for the analysis of time trend in seasonally varying water quality data from fixed, regularly sampled monitoring sites. This test is a non-parametric statistical analysis developed by the U.S. Geological Survey that analyzes the variation of data in each month over time. Concentrations of water quality constituents are often related to streamflow. In order to remove the effect of streamflow, flow adjustment procedures can be used. A time series of flow adjusted concentrations is developed, and that series is tested for trends. The flow adjusted concentration is defined as the actual concentration minus the expected concentration predicted from a discharge constituent regression equation.

Trends on flow-adjusted concentrations were determined at stations where the coefficient of determination (R^2) was greater than 0.5 and the regression was significant at the 95 percent probability level. If these conditions were not met, trend analysis was conducted on the raw data concentrations. For either the raw data or the flow adjusted data, the trend "p" level is the level of statistical significance of the Seasonal Kendall test. Values of "p" less than 0.05 are considered here to be significant and indicate a trend.

The methods described above were applied to the 45 stations in the DOW ambient monitoring network. The time frame for this analysis varies from station to station, depending on when station sampling was begun, or when a significant change in the basin occurred. In addition to these stations, the Ohio River Valley Water Sanitation Commission (ORSANCO) operates stations on the lower main stems of large rivers in Kentucky that flow into the Ohio River. ORSANCO has conducted trend analyses at their stations, using flow adjusted concentrations only. Results from DOW's and ORSANCO's analyses are presented in Appendix A, which also lists summary water quality statistics for the stations tested for trends.

The data in the appendix shows the variability of water quality and trends in Kentucky. Some parameters are increasing at various stations and decreasing at others. An effort to determine the magnitude of trends was not conducted for this report, but should be conducted as a follow-up to this analysis to further determine the relative importance of a reported trend. Several stations stand out for further review: the Nolin River at White Mills, the South Fork of Elkhorn Creek near Midway, Levisa Fork at Pikeville, and Clarks River at Almo. The Nolin River data indicates an increase in specific conductance, pH, chlorides, sulfate, total phosphorus, total recoverable zinc, BOD, and suspended solids. These increases may be the result of contributions from the City of Elizabethtown's wastewater treatment plant. The South Fork of Elkhorn Creek data are indicating increasing dissolved oxygen, and decreasing specific conductance, alkalinity, and total phosphorus. These improvements are attributed to increased treatment of wastewater at the City of Lexington's Town Branch wastewater treatment plant.

In addition to specific stations, some parameters exhibit trends statewide. Total phosphorus decreased at all stations in the Big Sandy and Cumberland River Basins, and at seven other stations statewide. It increased at three stations. The pH is increasing at many stations, and not decreasing at any. Total recoverable lead is decreasing at most stations in the Green River Basin, decreasing at ten stations in other basins, and increasing at three stations. Chloride is increasing in 14 stations statewide and decreasing in only one. Specific conductance is increasing in 12 stations and decreasing in three. Specific causes for these trends are not readily apparent.

Public Health/Aquatic Life Impacts: Toxics

The biological monitoring program focuses on the protection of aquatic life from toxics and conventional pollutants. However, one of the underlying themes of aquatic life protection is public health protection. The DOW has played an increasing role in public health protection through assessing the need for fish consumption advisories based on fish tissue contamination by toxic pollutants. In addition, the Division assisted EPA in a national study to determine the extent of dioxin, chlordane and PCB contamination in fish tissue. These are discussed below. An update of the preliminary list of waters impaired by toxic pollutants (the 304(l) waters) which was reported in the 1988 305(b) Report is also provided in this section.

Fish Consumption Advisories

Four individual fish consumption advisories are currently in effect within the Commonwealth of Kentucky. Two of these, Town Branch/Mud River and West Fork Drakes Creek, were discussed in the 1988 305b report and are still in place. Two new fish consumption advisories were issued in 1989 and involve Little Bayou Creek (McCracken County) and four locations on the Ohio River. All four advisories are briefly summarized in Table 9, and are discussed in detail below.

All of the advisories are based on contaminant residues exceeding the respective Federal Food and Drug Administration (FDA) action levels in edible portions (fillets). For each advisory, PCBs are a contaminant of concern; chlordane is also of concern at three of the Ohio River locations. In each case, the advisories were jointly agreed upon and issued by the Kentucky Natural Resources and Environmental Portection Cabinet (KNREPC), the Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Cabinet for Human Resources (CHR).

Town Branch/Mud River. This advisory was discussed in the 1988 305b Report. Clean-up activities have been conducted on-site and at several off-site locations. Groundwater monitoring has been initiated and sediment clean-up in Town Branch is scheduled to begin in 1990. Fish-tissue monitoring will also be conducted during these clean-up activities.

West Fork Drakes Creek. This advisory was also included in the 1988 305b report. Fish-tissue monitoring has been continued and the PCB levels appear to be declining. Additional sampling was done during 1988 and the stream is scheduled to be sampled during 1990.

Little Bayou Creek. This stream was placed under a fish consumption advisory in April, 1989, after the DOW received and reviewed fish-tissue data from the Paducah Gaseous Diffusion Plant (PGDP). The plant is currently conducting on-site clean-up activities, monitoring effluent quality, and performing groundwater studies. Chemical, ecological, and fish-tissue evaluations have been conducted in Big and Little Bayou Creeks by the University of Kentucky. Fish samples collected from nearby ponds on the West Kentucky Wildlife Management Area and from Metropolis Lake generally do not indicate PCB contamination. Additional monitoring at the PGDP is scheduled during 1990.

The Ohio River. This advisory was based on fish-tissue samples collected and analyzed in cooperation with ORSANCO during 1987 and 1988 (Table 10). After reviewing the data from both years, Kentucky proceeded to issue a fish consumption advisory at four locations where PCBs and/or chlordane exceeded the respective

Table 9
Fish Consumption Advisory Summary

Stream	Pollutants	Source	Miles Covered	Date Established	Comments
Town Branch/Mud River (Logan, Butler, and Muhlenberg counties)	PCBs	Dye-casting plant	64.7	October 1985	Cleanup in progress; monitoring continues
West Fork Drakes Ck. (Simpson and Warren counties)	PCBs	Adhesive plant	46.8	April 1985	Monitoring continues; levels in fish appear to be declining
Little Bayou Ck. (McCracken County)	PCBs	Gaseous diffusion plant	5.0	April 1989	On-site clean-up in progress; monitoring continues; contamination appears limited to Little Bayou Creek
Ohio River Location					
Mill Creek (RM 472.8)	PCBs Chlordane	Urban runoff; no known point source discharge		June 1989	Catfish and white bass listed; monitoring continues; revised in 1990 to cover entire Ohio River
McAlpine Lock and Dam (RM 606.8)	PCBs Chlordane	Urban runoff; no known point source discharge		June 1989	Catfish listed; monitoring continues
West Point (RM 625.9)	PCBs Chlordane	Urban runoff; no known point source discharge		June 1989	Catfish, carp, white bass listed; monitoring continues
Smithland (RM 918.5)	PCBs	Urban runoff; no known point source discharge		June 1989	Catfish listed; monitoring continues

FDA action levels (2.0 and 0.3 ppm respectively); only the species which exceeded FDA action levels were listed in the advisory. The advisory was interpreted by ORSANCO to include the entire pool in which the sampling site was located.

Based on 1989 ORSANCO data (Table 10), the advisory was amended to cover Kentucky's portion of the Ohio River. Follow-up sampling at the sites of concern was recommended to be included in ORSANCO's 1990 sampling schedule.

National Bioaccumulation Study

Eleven locations in Kentucky have been sampled as part of the National Dioxin Study and the National Bioaccumulation Study conducted by U.S. EPA. The Division of Water participated in these studies by providing information on sampling locations and by collecting fish samples for analysis by U.S. EPA/Region IV. Samples representing nine species have been collected and analyzed during these studies. Three major contaminants have been found: chlordane, dioxin, and PCBs (Table 11).

Data from these studies indicated two areas where FDA action levels were exceeded in fillet samples: the Ohio River at West Point and the Mud River at Cooperstown. Both of these areas are currently under a fish consumption advisory.

Only one sample collected by Kentucky during these studies has approached the FDA action level for dioxin (25 ppt). A 1989 composite fillet sample taken from two striped bass collected in the Big Sandy River near Catlettsburg, Kentucky was analyzed by U.S. EPA/Region IV and found to contain 22.8 ppt dioxin (Table 11). As a result, follow-up fish and sediment sampling will be conducted in this area. Currently, no fish consumption advisory has been issued.

Table 10
PCB and Chlordane Concentrations in ORSANCO Fish Samples, 1987-1989
(ppm)

Location	Species	PCBs 1987	PCBs 1988	PCBs 1989	Chlordane 1987	Chlordane 1988	Chlordane 1989
Greenup	Carp	0.47	NS	NS	0.07	NS	NS
	Channel Catfish	0.37	NS	NS	0.07	NS	NS
	Walleye	ND	NS	NS	ND	NS	NS
Meldahl	Carp	<0.1	0.51		0.02	<0.05	
	Smallmouth Buffalo			0.60			<0.10
	Channel Catfish	0.18	0.20		0.03	0.16	
	White Bass		0.65			<0.05	
	Bass	0.13			ND		
Licking River at Covington	Carp	ND	NS	NS	ND	NS	NS
	Channel Catfish	ND	NS	NS	ND	NS	NS
	Largemouth Bass	ND	NS	NS	ND	NS	NS

Table 10 (Continued)

Location	Species	PCBs 1987	PCBs 1988	PCBs 1989	Chlordane 1987	Chlordane 1988	Chlordane 1989
Mill Creek	Carp	ND		NS	ND		NS
	Channel Catfish	2.76*	2.54*	NS	0.30*	0.28	NS
	White Bass	3.24*	0.77	NS	0.16	0.05	NS
Markland	Carp	0.17	NS	NS	0.01	NS	NS
	Channel Catfish	0.74	NS	NS	0.12	NS	NS
	White Bass		NS	NS		NS	NS
	Crappie/Bass	0.57	NS	NS	0.02	NS	NS
McAlpine	Carp	0.74			0.24		
	Channel Catfish	ND	4.60*	2.63*	ND	0.60*	0.43*
	Smallmouth Buffalo			0.17			<0.10
	White Bass						
	White Crappie			<0.05	<0.10		
	Freshwater Drum			0.62			<0.10
	Carp/Bass/Sauger	0.08			0.01		
West Point	Carp	0.27	2.35*	NS	0.76*	0.35*	NS
	Channel Catfish	2.76*	0.64	NS	0.88*	0.10	NS
	White Bass	2.20*		NS	0.12		NS
	Black Bass		0.06	NS		<0.05	NS
Cannelton	Carp	0.18	NS	0.13	0.08	NS	<0.10
	Channel Catfish	0.92	NS	1.65	0.18	NS	0.21
	White Crappie		NS	<0.05		NS	<0.10
	Walleye/Sauger	<0.1	NS		ND	NS	
Newburgh	Carp	ND	NS		ND	NS	
	Channel Catfish	0.27	NS	1.66	0.07	NS	0.32*
	Smallmouth Buffalo		NS	0.60		NS	<0.10
	White Bass		NS	0.23		NS	<0.10
	Crappie	0.10	NS		ND	NS	
Green River at Seabree	Carp	0.13	NS	NS	ND	NS	NS
	Channel Catfish	0.13	NS	NS	ND	NS	NS
	White & Smallmouth Bass	ND	NS	NS	ND	NS	NS
Uniontown	Carp	0.19	NS	NS	0.04	NS	NS
	Channel Catfish	ND	NS	NS	ND	NS	NS
	Crappie	ND	NS	NS	ND	NS	NS
Smithland	Carp	0.45	NS	1.66	0.07	NS	<0.10
	Channel Catfish	2.48*	NS	0.43	0.21	NS	<0.10
	Blue Catfish		NS	0.23		NS	<0.10
	Bigmouth Buffalo		NS	0.21		NS	<0.10
	Smallmouth Bass	1.03	NS		ND	NS	

NS = Not Sampled, ND = Not Detected, * = Exceeds FDA Action Level

Table 11
National Bioaccumulation Study Results
(Dioxin, Chlordane, PCBs) for Kentucky

Site	Dioxins (ppt) 2,3,7,8 TCDD	2,3,7,8 TCDF	TEC	Chlordane (ppm)	PCBs (ppm)	% Lipid
Big Sandy River						
Catlettsburg (1987)						
Carp (WB; n=5)	4.38	3.05	5.72	0.215	1.218	7.0
Sauger (F; n=4)	0.67	ND	0.67	0.0046	0.094	0.6
Catlettsburg (1989)						
Carp (WB; n=3)	3.22	1.42	4.47	-	-	7.5
Carp duplicate	2.26	1.38	3.64	-	-	7.8
Carpsucker (WB; n=3)	1.90	0.68	1.97	0.0702	0.504	2.8
Carpsucker duplicate	-	-	-	0.0729	0.529	2.9
Striped Bass (F; n=2)	21.55	3.62	22.8	0.0733	0.741	1.2
Ohio River						
Cannelton (1984)						
Carpsucker (WB; n=1)	-	-	3.9	0.426	1.777	8.8
Carpsucker (F; n=2)	-	-	ND	-	-	-
Sauger (WB; n=2)	-	-	4.1	-	-	-
Sauger (F; n=1)	-	-	ND	-	-	-
Markland (1985)						
Carp (WB; n=2)	-	-	13.0	-	-	-
Carp (F)	-	-	6.4	-	-	-
Largemouth Bass (WB; n=5)	-	-	4.2	-	-	2.5
Largemouth Bass (F)	-	-	ND	-	-	2.5
Uniontown (1984)*						
Bottom feeder (WB)	-	-	3.4	-	-	-
Predator (WB)	-	-	ND	-	-	-
West Point (1984)*						
Bottom feeder (WB)	-	-	5.2	-	-	-
Predator (WB)	-	-	2.1	-	-	-
West Point (1987)						
Carp (WB; n=3)	4.38	3.23	7.37	0.403	1.366	7.2
Largemouth Bass (F; n=5)	ND	ND	0.00	-	-	2.5

Table 11 (Continued)

Site	Dioxins (ppt) 2,3,7,8 TCDD	2,3,7,8 TCDF	TEC	Chlordane (ppm)	PCBs (ppm)	% Lipid
<u>Cave Run Lake</u>						
1984						
Carp (WB; n=3)	-	-	ND	-	-	-
<u>Kentucky River</u>						
Gest (1985)						
Carp (WB; n=2)	-	-	0.8	-	-	-
Largemouth Bass (WB; n=2)	-	-	ND	-	-	-
Largemouth Bass (F; n=5)	-	-	ND	-	-	-
<u>Mud River</u>						
Cooperstown (1987)						
Carp (WB; n=3)	ND	23.53	3.16	0.195	24.12	7.4
Rock Bass (F; n=5)	ND	8.63	0.88	0.0052	0.780	1.1
<u>Green River</u>						
Beech Grove (1984)						
Carp (WB; n=4)	-	-	ND	-	-	-
<u>Kentucky Lake</u>						
1984						
Carp (WB; n=5)	-	-	ND	-	-	-
<u>Mississippi River</u>						
Wickliffe (1988)						
Carp (WB; n=4)	4.75	6.46	6.79	0.124	0.757	7.4
Carp duplicate	4.48	6.79	6.55	-	-	7.3
White Bass (F; n=7)	1.42	2.91	1.98	-	-	1.9

WB = Wholebody, F = fillet, ND = nondetected, TEC = toxicity equivalent concentration, n = number of fish analyzed
*Information obtained from U.S. EPA. 1987. The National Dioxin Study: Tiers 3,5,6 and 7. EPA 440/4-87-003. U.S. EPA, Washington, D.C. 20460.

Section 304(l) Waters

Section 304(l) of the 1987 Clean Water Act amendments required states to list waters impaired by: 1) point source discharges of toxic (priority or 307(a)) pollutants; 2) point and/or nonpoint (or unknown) sources of toxic pollutants causing violations of state numeric water quality standards; and 3) conventional or nonconventional pollutants from any source. These three lists have been commonly referred to as the short, mini, and long lists, respectively. As the intent of 304(l) was primarily to identify streams with toxic pollutant problems from point sources, the short list was the focus of the effort.

Kentucky presented the methodology and preliminary 304(l) lists in its 1988 305(b) report. Following several more months of data collection and evaluation, the final State lists (including seven industrial and 14 municipal facilities, two Superfund sites, and one U.S. Department of Energy facility on the short list) were submitted to EPA on February 4, 1989. This list differed from the preliminary short list in that three municipalities and nine industrial facilities were deleted because more recent data indicated that the water quality problem had been resolved due to more effective controls, or a facility no longer had an active point source discharge. Examples of the latter case included facility closure, product line changes, or routing of process wastewater to a municipal sewer system. For those facilities on the State's "final" short list, individual control strategies (ICS), consisting of adequate KPDES permits, were already finalized or drafted for all but seven municipalities. (If the states refused to issue revised permits by objecting to either the listing itself or the permit conditions, EPA was prepared to issue the permit).

EPA approved the majority of Kentucky's final lists on June 4, 1989, but disapproved those six municipalities for which permits did not yet contain biomonitoring requirements to control toxicity. However, it was understood that Kentucky would have these permits in draft form by June 4, 1990, in final form by February 4, 1991, and that the facilities would be in compliance by June 4, 1993. The approved ICSs for the other 17 facilities were required to be final as of February 4, 1990, and these facilities must comply with their permits by June 4, 1992. EPA also determined on June 4 that two bleached-kraft paper mills should be short-listed for dioxin.

EPA then weighed existing and new information and solicited public comment. Based on these deliberations, final lists, pollutant loadings, and ICS statuses were published on February 4, 1990. These lists differed from the final State lists submitted a year earlier in the following areas: 1) the City of Danville was deleted from the short list; 2) the two Superfund sites, Maxey Flats low-level radioactive waste disposal facility and Smith Farm landfill, were given deferred decisions due largely to the difficulty in defining them as point sources; and 3) two stream segments, Muddy Creek (a tributary to Rough River) and the Upper Green River, were added to the long list as a result of information contained in the SARAH Title III data submissions by the regulated community. The two bleached-kraft paper mills which EPA had proposed placing on the short list on June 2, 1989 were not included on the final short list because of data made available to EPA during the comment period. These data showed that: 1) dioxin levels in the effluents were not sufficient to cause instream problems due to the large dilution flows in the Ohio River and Mississippi River; and 2) dioxin levels found in fish flesh were not significantly higher downstream of the paper mills than upstream of the mills. The final mini and short lists (Tables 12 and 13) are provided in this report to update the preliminary lists presented in the 1988 305(b) Report. The ICS strategies approved as of June 2, 1989 are provided in Table 14 and the statuses of the disapproved ICS's are provided in Table 15. The long list can be found in the 1988 305(b) Report.

Table 12
304(l)(A)(i) or Mini List

Waterbody	Reach Number	Toxics
Licking River	05100101	Zinc
Stoner Creek	05100102	Zinc
South Fork Licking River	05100102	Metals
North Fork Kentucky River	05100201	Zinc
Red River	05100204	Zinc
Town Br. & S. Elkhorn Cr.	05100205	Zinc
Valley Creek	05110001	Cadmium Zinc
West Fork and Drakes Creek	05110002	PCBs
Town Br. and Mud River	05110003	PCBs
Unnamed tributary and East Fork Lynn Camp Creek	05130101	Zinc
Cumberland River	05130101	Zinc
Unnamed tributary and South Fork Little River	05130205	Zinc
Little River	05130205	Zinc
Cumberland River	05130205	Zinc
Chenoweth Run	05140102	Zinc
Pond Creek	05140102	Zinc, Cadmium Chromium
Salt River	05140102	Zinc
Bayou Creek/Little Bayou Creek	05140206	PCBs
E. Fork Clarks River	06040006	Zinc
Mayfield Creek	08010201	Zinc

Table 13
304(l)(B) and (C) or Short List

Point Source Name	Waterbody	Reach Number	Pollutant(s)	Amount to Be Controlled (lb/day)
Paris STP	Stoner Creek	05100102	Lead	0.51
Lexington (Town Br.) STP	Town Br. & S. Elkhorn Cr.	05100205	Lead Copper	1.73 3.37
North American Phillips Lighting	Unnamed trib. & Clarks Run	05100205	Lead	0.03
Eminence STP	Fox Run	05140102	Copper	0.54
Magnet Wire Co.	Ash Run	05140101	Copper	0.12
Cardinal Aluminum	Pond Creek (N. Ditch)	05140102	Copper Silver	0.26 0.04
Cardinal Extrusions	Spring Ditch & Pond Creek	05140102	Copper Silver	0.01 0.002
Campbellsville STP	Little Pitman Cr.	05140102	Copper Lead	2.40 0.48
Elizabethtown STP	Valley Creek	05110001	Cadmium Zinc	0.79 8.79
Horse Cave STP	Hidden River (underground to Green River)	05110001	Copper Silver	0.38 0.13
Madisonville STP	Unnamed trib. & Flat Creek	05110006	Lead	0.47
Corbin STP	Lynn Camp Creek	05130001	Copper	0.85
National Standard Co.	Unnamed trib. & East Fork Lynn Camp Creek	05130205	Zinc	0.14
Russell Co. STP	Big Lily Cr.	05130103	Copper	1.12
Pop Fasteners	Unnamed trib. & South Fork Little River	05130205	Zinc	0.02
Hopkinsville Northside STP	North Fork Little River	05130205	Copper	0.56

Table 13 (Continued)

Point Source Name	Waterbody	Reach Number	Pollutant(s)	Amount to Be Controlled (lb/day)
Hopkinsville Hammond-Wood STP	North Fork Little River	05130205	Copper	0.66
Jeffersontown STP	Chenoweth Run	05140102	Zinc	6.71
Marion STP	Rush Creek	05140102	Copper	1.13
Paducah Gaseous Diffusion Plant (U.S. Dept. of Energy)	Bayou Creek/ Little Bayou Creek	05140206	PCBs	4.6 ug/l*
B.F. Goodrich	Tennessee River	06040006	1,2-Dichloro-ethane	12.27

*ug/l = micrograms/liter = 10^{-6} grams/liter

Table 14
Individual Control Strategies
Approved as of June 2, 1989

Point Source	Waterbody	KPDES Permit No.	ICS Status
Paris STP	Stoner Creek	KY0021059	Final permit issued; acceptable ICS
Lexington (Town Br.)	Town Br. & S. Elkhorn Cr.	KY0021491	Final permit issued; acceptable ICS
North American Phillips Lighting	Unnamed trib. & Clarks Run	KY0002607	Draft permit; if permit is issued by 2/4/90 as drafted, the ICS would be acceptable
Eminence STP	Fox Run	KY0026883	Final permit issued; acceptable ICS

Table 14 (Continued)

Point Source	Waterbody	KPDES Permit No.	ICS Status
Magnet Wire Co.	Ash Run	KY0002208	Final permit issued; acceptable ICS
Cardinal Aluminum	Pond Creek	KY0071978	Final permit issued; acceptable ICS
Cardinal Extrusions	Spring Ditch & Pond Creek	KY0034835	Final permit issued; acceptable ICS
Horse Cave STP	Hidden River (underground to Green River)	KY0041092	Final permit issued; acceptable ICS
National Standard Co.	Unnamed trib. & East Fork Lynn Camp Creek	KY0003778	Final permit issued; acceptable ICS
Russell Co. STP	Big Lily Creek	KY0062995	Final permit issued; acceptable ICS
Pop Fasteners	Unnamed trib. & South Fork Little River	KY0003786	Final permit issued; acceptable ICS
Hopkinsville Hammond-Wood STP	North Fork Little River	KY0066532	Final permit issued; acceptable ICS
Marion STP	Rush Creek	KY0020661	Final permit issued; acceptable ICS
Paducah Gaseous Diffusion Plant (U.S. Dept. of Energy)	Bayou Creek/ Little Bayou	KY0004049	Final permit issued; acceptable ICS
B.F. Goodrich	Tennessee River	KY0003484	Final permit issued; acceptable ICS

Table 15
Individual Control Strategies
Disapproved as of June 2, 1989 and Current Status

Point Source	Waterbody	KPDES Permit No.	Current ICS Status
Campbellsville STP	Little Pitman Cr.	KY0054437	Draft permit; if permit is issued by 2/4/91 as drafted, the ICS would be acceptable
Elizabethtown STP	Valley Creek	KY0022039	Final permit issued; acceptable ICS
Madisonville STP	Unnamed trib. & Flat Creek	KY0022942	Final permit issued; acceptable ICS
Corbin STP	Lynn Camp	KY0020133	Final permit issued; acceptable ICS
Hopkinsville Northside STP	North Fork Little River	KY0023388	Final permit issued; acceptable ICS
Jeffersontown STP	Chenoweth Run	KY0025194	Final permit issued; acceptable ICS

Public Health/Aquatic Life Impacts: Non-toxics

Non-toxics are conventional pollutants such as chlorine, un-ionized ammonia, oxygen demanding substances, and pathogenic organisms such as bacteria and viruses. These pollutants are a cause of concern because they are often responsible for fish kills, or like bacteria and viruses, can pose a threat to human health. Reports on fish kills, bacteriological evaluations of streams, and beach closures are discussed below.

Fish Kill Incidents

Forty-two fish kill reports were received by KDFWR between January 1, 1988 and December 31, 1989. These involved slightly more than 153 stream miles and nine surface acres on 35 different waterbodies. Fourteen major causes were identified, with organic enrichment by wastewater treatment plants (WWTPs) or animal wastes, and petroleum-related pollution being predominant (33%). Over 541,000 fish valued at approximately $133,000 were estimated to have been killed. The single largest fish kill during this period was caused by a thermal discharge to the Green River. Almost half (20) of the fish kills investigated occurred in July, August, and September. Table 16 summarizes the severity, causes, and locations of fish kills during 1988-89. Appendix B shows a more detailed list of the fish kills which were investigated.

Table 16
Fish Kill Summary

		Number Reported		
		1988	1989	Total
Severity:	Light (<100)	0	0	0
	Moderate (100-1,000)	8	5	13
	Major (>1,000)	10	9	19
	Unknown	1	9	10
	Total	19	23	42
Cause:	Sewage (WWTP)	4	7	11
	Agricultural operation	1	2	3
	Mining or oil operation	2	1	3
	Oil or chemical spill	3	2	5
	Natural (low D.O., etc.)	4	3	7
	Misc. (sediment, heated water, etc.)	2	3	5
	Unknown	3	4	7
	Total	19	23	42
River Basin:	Big Sandy			
	Licking			
	Kentucky	7	7	14
	Salt	1	4	5
	Green	3	3	6
	Upper Cumberland	1	2	3
	Lower Cumberland	0	0	0
	Tennessee	0	1	1
	Ohio tributaries	7	6	13
	Total	19	23	42
Approximate number of stream miles		105.6	47.8	153.3
Approximate acres of lakes		0	9	9
Estimated number of fish killed		319,212	222,330	541,542

A ten year synopsis (1980-89) of fish kill records is shown in Table 17. During this period, the number of major (>1000 fish) fish kills occurring each year has remained fairly low ($\leq$10). For the current 305(b) reporting period (1988-89), the number of fish kills recorded (42) and the number of waterbodies affected (39) are lower than the previous four 305(b) reporting periods; however, the number of stream miles affected (153.34) and the number of fish killed (541,542) are higher than in previous periods.

Table 17
Fish Kill Synopsis, 1980-1989

Year	Number of Incidents	Number of Water-bodies	Stream Miles Affected	Surface Acres Affected	Number Fish Killed	Number Major Fish Kills*	Known Causes
1979	15	15	NR	NR	NR	NR	5
1980	24	25	53.21	-	224,163	10	10
1981	26	30	74.33	-	81,266	7	10
1982	26	28	51.95	42-103	98,436	5	12
1983	36	41	51.32	7.0	76,187	8	19
1984	33	35	67.28	47.5	106,514	7	18
1985	29	27	86.88	4.5	59,499	5	9
1986	23	20	23.34	47.0	129,560	8	9
1987	30	32	58.29	200.0	229,583	10	14
1988	19	16	105.56	-	319,212	10	10
1989	23	23	47.78	9.0	222,330	9	11
Total	-	-	619.94	418.0	1,546,750	79	-

*>1000 fish killed
NR = Not Recorded

Bacteriological Evaluations of Recreation Uses

During the 1988 - 1989 recreation seasons, bacteriological surveys were conducted in the areas listed below. Fecal coliform, fecal streptococci, and Escherichia coli (E. coli) bacteria are measured in water samples as indicators of other disease-causing bacteria. The most common illnesses experienced from swimming in fecally polluted waters are gastroenteritis, ear infections, and skin infections (swimmers itch).

- Little River Basin
- Brooks Run, Jefferson County
- Kentucky River at Frankfort
- Big Sandy River Basin
- Yellow Creek
- Elkhorn Creek River Basin
- Kentucky River at Fort Boonesborough State Park.

The Little River and Yellow Creek bacteriological surveys were part of an intensive survey. The Big Sandy River and Elkhorn Creek basins were surveyed as a result of these streams being reported as not supporting primary contact recreation (PCR) use in the 1986 305(b) Report. The Kentucky River at Fort Boonesborough State Park was surveyed at the request of the Department for Human Resources in response to closing the beach because of fecal coliform contamination. Brooks Run was surveyed as a result of media concern over its use for baptisms. Other surveys were conducted as a result of enforcement action or complaint investigations. Primary contact recreation use support was evaluated using the following criteria: if the geometric mean (GM) of the fecal coliform (FC) counts from a minimum of five samples was above 200 colonies / 100 ml, or if less than five samples from a site were collected and any counts were above 400 colonies / 100 ml, the use was not supported. The results from the above evaluations were incorporated into the use support assessments reported in this chapter.

Beach Closures

During the 1988 - 1989 PCR seasons, beaches were closed at three state parks by the Department of Parks. They were:

- July 9, 1988 — Fort Boonesborough State Park. Closed for the season due to drought conditions and bacterial contamination.

- July, 1988 — John James Audubon State Park. Closed due to bacterial contamination.

- o June 23, 1989 Greenbo Lake State Resort Park. Closed for the season due to bacterial contamination.

- o July 27, 1989 Fort Boonesborough State Park. Closed for the season due to bacterial contamination.

Wetland Information

Wetlands are among the most beneficial and productive ecosystems in the world, with numerous integral functions and values, although historically they have been regarded as wastelands. Wetlands have been described as "kidneys of the landscape" because of their functions in hydrologic and chemical cycling of wastes. A summary of wetland functions and values include: (1) flood storage capacity, (2) flood conveyance, (3) sediment control, (4) biological nutrient source, (5) water quality enhancement, (6) groundwater recharge, (7) habitat for wetland flora and fauna, (8) recreation, (9) education and scientific research, (10) timber and food production, (11) abating pollution, and (12) aesthetics and open space. Because the public is beginning to realize the importance of wetlands, especially to flood storage and water quality, regulatory agencies are being asked to do more to protect these valued resources.

Wetlands are defined as land that has a predominance of hydric soils and that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions. Therefore, three criteria are required to identify wetlands: (1) hydrophytic vegetation, (2) hydric soils, and (3) hydrology. The problem with determining the boundaries of a regulated wetland typically lies in the transition between wetland and upland where identifying all three criteria can be difficult. The DOW participates with the U.S. Army Corps of Engineers (COE) in jurisdictional delineations, and adheres to the 1989 Federal Manual for Identifying and Delineating Jurisdicational Wetlands, which is a joint interagency publication by the COE, U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), and U.S. Soil Conservation Service.

According to the most recent (1979) USFWS classification system, the majority of Kentucky's wetlands fall in the Palustrine System. Areas lying shoreward of rivers and lakes, including floodplains, oxbows, ponds, marshes, and swamps are members of the Palustrine System. The broad alluvial floodplains of the Ohio and Mississippi rivers and their tributaries in western Kentucky comprise the vast majority of Kentucky's wetlands. The class type within these floodplain areas is mostly bottomland hardwood forests with inclusions of scrub-shrub and emergent types of vegetation. Small ponds are common throughout the state and their area is difficult to assess. However, ponds have important value as ecological epicenters.

The Riverine System includes all wetlands and deepwater habitats contained within a channel that experiences continuously or periodically moving water or connects two bodies of standing water. While wetlands of this type are not extensive in Kentucky, they provide a unique habitat for many rare or endangered species, sustain the hydrology for Palustrine Systems, and convey flood waters.

Lacustrine Systems, such as deep water habitats in lakes, are the least ecologically significant type of Kentucky wetland. These systems are limited in Kentucky to man-made lakes, their shorelines, and spillways.

The loss of valuable wetland resources, and adverse impacts to remaining areas, are of special concern to Kentucky. Over half of the original wetland acreage has been destroyed. Nearly all of the areas that remain have been degraded by pollutants, such as pesticides, acid mine drainage, siltation, brine water, and/or domestic and industrial sewage. However, Kentucky still does not have an active wetland monitoring program. There continues to be a poor understanding of what once occurred, what is left, and current impacts and rates of loss.

Nonpoint source impacted wetlands, which were identified in the 1989 Kentucky Nonpoint Source Pollution Assessment Report, will be compiled and listed for distribution. This list will be provided to appropriate regulatory and non-regulatory agencies for the purpose of exchanging data, and for encouraging agencies to increase education and regulatory efforts in those areas. Land owners will be encouraged to implement best management practices designed for surface waters in protecting and/or abating nonpoint source impacts to wetlands areas.

Few wetland studies have been conducted in Kentucky, although extensive wetland systems occur in the Jackson Purchase area and western coalfields. One of the most significant wetland studies was made by Mitch et al. (1982), which included wetland classification, mapping, ecosystem modelling, and wetland management in the western coalfield region of the state. Their analysis clearly revealed that coal mining and oil extraction affected the health of wetlands in the coalfield region. Also, other activities, such as logging, channelization, and impoundments have significantly altered those wetlands. The major threats to Kentucky's wetlands are competing land use activities and poor land management practices.

In 1985, the DOW provided funding to the Kentucky State Nature Preserves Commission to determine the status of Kentucky's wetlands. Recommendations for protection of remaining wetland areas were included in their 1986 report Wetland Protection Strategies for Kentucky. Among their findings was an estimate that, as of 1978, 58 percent, or 929,000 acres, of the original 1,566,000 acres of wetland soils in Kentucky had been drained. Further, it was estimated that only 20 percent of Kentucky's wetland soils remain forested, which reflects a dramatic decline in bottomland hardwood wetlands. The Kentucky Department of Fish and Wildlife Resources estimates Kentucky's annual rate of wetland loss at 3,600 acres. This information only provides a rough estimate of Kentucky's wetland trends. More detailed analyses will be available at the conclusion of a current wetland mapping project. Under the USFWS National Wetlands Inventory, all of Kentucky's wetlands will be mapped by 1991.

Currently, in cooperation with the COE and the EPA, Kentucky has begun an Advanced Identification (ADID) study under Section 230.80 of the 401(b)(1) Guidelines to collect information on the natural value of wetlands in the western coalfield region of Kentucky. The study area includes the four counties of Butler, Hopkins, Muhlenberg, and Ohio. The general objectives of ADID are to identify wetland sites with areas of high ecological value, which are in need of protection from future fill activities, and areas of low ecological value, which could serve as potential future disposal sites. The information gathered in the field and office will be used to produce maps depicting wetlands that are suitable or unsuitable for mining activities.

Kentucky has assumed primacy for all programs of the Clean Water Act (CWA) with the exception of Section 404, the Dredge and Fill Permit Program. Under Federal requirements, total authority for the 404 program cannot be extended to the states since the COE retains jurisdiction over activities in "traditionally navigable waters". The phrase "navigable waters" is defined as waters which are presently used, have been used, or may be susceptible to use in transporting interstate or foreign commerce, which includes areas subject to the ebb and flow of the tide, shoreward to the mean high water mark. Under the terminology of the Federal regulations, "navigable waters" is also known as "Phase I Waters", and the actual determining of Phase I Waters is made by the COE.

Waterbody areas, known as Phase II and III Waters, which are not regarded as "navigable waters" by the COE, could be administered by the state. Phase II Waters include tributaries and adjacent wetlands associated with Phase I Waters. Phase III Waters are the remainder of the waters of the state up to the headwaters. The state is allowed to assume jurisdiction over these areas. The DOW has studied the feasibility of administering the Dredge and Fill program, but concluded that the state lacked the necessary funding and staff to assume primacy. However, should funding become available, the Division is the logical state agency to assume the program.

Currently, wetland protection legislation does not exist for Kentucky. Kentucky water quality standards regulations include wetlands as waters of the Commonwealth, but do not provide specific wetlands criteria. Under these regulations, three of Kentucky's wetlands have been proposed as outstanding resource waters. Since wetlands are listed as waters of the Commonwealth within the regulations, they are designated for all uses until specifically designated otherwise. The Division has recently added the wetlands definition cited above to the proposed water quality standards.

Under Section 401 of the CWA, the Division is applying applicable water quality standards to wetlands. Section 401 states that "any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the State ... that any such discharge will comply with the applicable (water quality) provisions ...". Chapter 224 of the Kentucky Revised Statutes and Title 401, Chapter 5, Kentucky Administrative Regulations provides that the Natural Resources and Environmental Protection Cabinet has the authority to regulate the discharge of pollutants into any of the waters of the Commonwealth, including wetlands, and is the Section 401 "certifying agency". Title 40, Code of Federal Regulations, Part 121 provides that the certifying agency may place "any conditions which are deemed necessary or desirable with respect to the discharge or the activity." The Division has prepared a grant proposal to EPA Region IV to develop specific 401 implementing regulations. Such regulations would enhance wetlands protection at the state level.

Through the coordinated state review process for Section 404 and Section 10 activities, the Department for Environmental Protection provides all resource agencies within state government an opportunity to comment on proposed activities within regulated waters, including wetlands. The Department will consider all comments and formulate a final, coordinated response, on behalf of the Governor, to the COE. Typically, DOW and the Kentucky Department of Fish and Wildlife Resources provide detailed comments on projects that may impact wetlands.

CHAPTER 2

WATER QUALITY ASSESSMENT OF LAKES

WATER QUALITY ASSESSMENT OF LAKES

Section 314 of the Clean Water Act of 1987 requires that states submit a lake water quality assessment as part of their biennial 305(b) report. Six areas are to be included in the assessment. These are:

(1) An identification and classification according to eutrophic condition of all publicly owned lakes in a State.

(2) A general description of the State's procedures, processes, and methods (including land use requirements) for controlling lake pollution.

(3) A general discussion of the State's plans to restore the quality of degraded lakes.

(4) Methods and procedures to mitigate the harmful effects of high acidity and remove or control toxics mobilized by high acidity.

(5) A list and description of publicly owned lakes for which uses are known to be impaired, including those lakes which are known not to meet water quality standards or which require implementation of control programs to maintain compliance with applicable standards, and those lakes in which water quality has deteriorated as a result of high acidity that may reasonably be due to acid deposition.

(6) An assessment of the status and trends of water quality in lakes including the nature and extent of pollution loading from point and nonpoint sources and the extent of impairment from these sources, particularly with regard to toxic pollution.

The U.S. Environmental Protection Agency (EPA) has developed a guidance document (Guidelines for the Preparation of the 1990 State Water Quality Assessment (305(b) Report), February 1989) which includes a section on lake assessment reports. Kentucky's report generally complies with the guidelines suggested by the EPA.

Lake Identification

Appendix C lists publicly owned lakes for which data were available to assess trophic status. Much of this information came from lake surveys conducted by the Division of Water in 1981-1983 as part of an EPA cooperative agreement funded under Section 314 of the Clean Water Act. Kentucky received additional Section 314 funds in 1989 to update the original assessment. Lakes are being resurveyed by the Division of Water and Murray State University (under a Memorandum of Agreement) over a two year period to reassess their trophic status. The information from the 1989 surveys was used in this report. The 1992 305(b) Report will utilize the information collected from the lakes to be resurveyed in 1990. Not all of the significant publicly owned lakes in Kentucky are included in the table because data has not been collected from all such lakes. For purposes of this report, publicly owned lakes are those lakes which are owned or managed by a public entity such as a city, county, state, or federal agency where the public has free access for use. A nominal fee for boat launching charged by concessionaires may occur on some of these lakes. Lakes which are publicly owned, but restrict public access because they are used solely as a source of domestic water supply, are not included. These lakes do not qualify for federal restoration funds under the Clean Lakes Program and were not monitored in the lake classification survey. EPA guidance suggests that all significant lakes be included in state surveys. The term "significant" is to be defined by the state so that all lakes which have substantial public interest and use would be included. For this purpose, Kentucky considers all of the publicly owned lakes it has surveyed and listed in Appendix C and also those which have not yet been surveyed, but qualify as a publicly owned lake, as significant. All of these lakes have substantial local or regional public interest and use.

Trophic Status

Lake trophic state was assessed by using the Carlson Trophic State Index (TSI) for chlorophyll *a*. This method is convenient because it allows lakes to be ranked numerically according to increasing eutrophy and also provides for a distinction (according to TSI value) between oligotrophic, mesotrophic and eutrophic lakes. The growing season average TSI (chlorophyll *a*) value was used to rank each lake. Growing season was defined as the April through October period. A distinction was made for those lakes which exhibited trophic gradients. If lakes exhibited trophic gradients or embayment differences, those areas were analyzed separately.

The chlorophyll *a* index has proven its ability to detect changes in trophic condition. For instance, Carr Fork Lake data indicated that the lake was oligotrophic in 1978, 1979, and 1980. The mean TSI for those years was 29. In 1981, the TSI was 52 which is in the eutrophic range. The index value indicated that the lake had undergone a trophic state change. Subsequent inquiries revealed that the lake had been fertilized by the Kentucky Department of Fish and Wildlife Resources to increase fish production.

While there are several other methods of evaluating lake trophic state, the accuracy and precision of the chlorophyll *a* analytical procedure (determined from Division of Water quality control data) and proven ability of the chlorophyll *a* TSI to detect changes, made it the index of choice for classifying lakes in Kentucky's program.

Chlorophyll *a* concentration data from the ambient monitoring program, and the most current chlorophyll *a* data collected during the spring through fall seasons (a minimum of 3 samples) by the U.S. Army Corps of Engineers (COE) on several reservoirs which they manage, were used to update the trophic classifications for this report. Other data were obtained from a report on a study of Lake Barkley conducted by Dr. Joe M. King of Murray State University. Data averaged from water column depths of up to 20 feet were used in calculating TSI values. Table 18 contains the trophic state rankings of lakes of 5,000 acres or more in size and Table 19 lists and ranks the trophic state of lakes less than 5,000 acres in size. Lakes which have updated classifications are in bold face type. A "+" or "-" symbol is used to indicate a trend of increasing or decreasing trophy. Trends were defined as a change of ten units from a previous TSI score. This represents a doubling or halving of Secchi disk depth and was chosen because it is a noticeable indication of change.

A summary of Tables 18 and 19 indicates that of the 99 classified lakes, 56 (56%) were eutrophic, 31 (32%) were mesotrophic, and 12 (12%) were oligotrophic. This is based on the status of the major areas of lakes and does not account for the trophic gradient that exists in some reservoirs nor the trophic status of the embayments of others. The dynamic nature of these reservoirs makes it more

Table 18

Trophic State Rankings for Lakes
5,000 Acres or Greater in Area
(by Carlson TSI (Chl *a*) Values)

Lake	TSI (Chl *a*)*	Acres
	Eutrophic	
Barkley	61	45,600
Green River	**55+**	**8,210**
Nolin	**52**	**5,790**
Kentucky	52	48,100
	Mesotrophic	
Rough River	48	5,100
Barren River	**50**	**7,205**
Beaver Creek Arm	57 (Eutrophic)	1,565
Skaggs Creek Arm	**50 (Mesotrophic)**	**1,230**
Cave Run	**45**	**8,270**
	Oligotrophic	
Cumberland	38	49,364
Lily Creek Embayment	**58 (Eutrophic)**	**144**
Beaver Creek Embayment	**54 (Eutrophic)**	**742**
Laurel River	34	4,990
Midlake-Laurel Arm	47 (Mesotrophic)	754
Headwaters-Laurel Arm	58 (Eutrophic)	316
Dale Hollow	33	4,300

***Scale:** 0-40 Oligotrophic (nutrient poor, low algal biomass)
41-50 Mesotrophic (slightly nutrient rich, moderate amount of algal biomass)
51-69 Eutrophic (nutrient rich, high algal biomass)
70-100 Hypereutrophic (very high nutrient concentrations and algal biomass)

Bold Type = Updated Classifications,
+/- = upward trend (more eutrophic) or downward (less eutrophic)trend

Table 19

Trophic State Rankings for Lakes
Less Than 5,000 Acres in Area
(by Carlson TSI (Chl *a*) Values)

Lake	TSI (Chl *a*)*	Acres
	Hypereutrophic	
Reformatory	77+	54
	Eutrophic	
Swan	69	193
Arrowhead**	68	37
Fish	68	27
Spurlington	68+	36
Wilgreen	68	169
Briggs	67	18
Campbellsville City	67+	63
Jericho	67+	137
Marion County	67	21
Carpenter	66	64
Guist Creek	65	317
Kingfisher	65	30
McNeely	65	51
Buck	64	19
Kincaid	64	183
Taylorsville	64	3,050
Willisburg	64	126
Metropolis	63	36
Flat	62	38
Washburn	62	26
Doe Run	61+	51
Mauzy	61	84
Burnt Pond	60	10
Long Pond	60	56
Turner	60	61
Greenbriar	59	66
Scenic	59	18
Shanty Hollow	59	135
A.J. Jolly	58	204
Energy	58	370
Grapevine	58	50
Chenoa	57	37
Corinth	57	96
Sand Lick Creek	57	74
Beaver	56	158
Bullock Pen	56	134
Elmer Davis	56	149

Table 19 (Continued)

Lake	TSI (Chl *a*)	Acres
Spa	56	240
Boltz	**55**	**92**
Corbin	55	139
General Bulter	**55**	**29**
Morris	55	170
Herrington	**54**	**2,940**
Malone	54	826
Moffit	54	49
Carr Fork	**53**	**710**
Shelby	53	17
Carnico	53	114
Williamstown	52	300
Linville	52	273
Mill Creek (Monroe County)	51	109
	Mesotrophic	
Liberty	**50**	**79**
Long Run	**50**	**27**
Luzerne	50	55
Salem	50	99
Pennyrile	50	47
Caneyville	49	75
Hematite	**49**	**90**
Honker	**49-**	**190**
Peewee	**49**	**360**
Beshear	48	760
Fishpond	48	32
Freeman	48	160
Greenbo	**48**	**181**
Blythe	47	89
George	**47**	**53**
Loch Mary	**47**	**135**
Metcalfe County	**47**	**22**
Smokey Valley	**47**	**36**
Bert Combs	**46**	**36**
Dewey**	**46+**	**1,100**
Mill Creek (Powell County)	46	41
Wood Creek	**46+**	**672**
Laurel Creek	45	42
Buckhorn	44	1,230
Sympson	44	184
Paintsville	**43**	**1,139**
Pan Bowl	43	98
Lewisburg	41	51

Table 19 (Continued)

Lake	TSI (Chl *a*)	Acres
	Oligotrophic	
Tyner	40	87
Campton	40	26
Grayson	**39**	**1,512**
Cranks Creek	38	219
Fishtrap	**37**	**1,143**
Martins Fork	37	334
Stanford	**36**	**43**
Providence City	35	35
Cannon Creek	33	243

*Scale: 0-40 Oligotrophic, 41-50 Mesotrophic, 51-69 Eutrophic, 70-100 Hypereutrophic

Bold Type = Updated Classifications, ** = 2 samples only,
+/- = upward (more eutrophic) or downward (less eutrophic) trend

difficult to assign them a single trophic state because their water residence times, the nature of major inflows, and their morphology can result in different trophic states in separate areas. The tables indicate that trophic gradients exist in Barren River and Laurel River lakes and that certain embayments of Lake Cumberland are eutrophic, while the main lake area is oligotrophic.

The 99 assessed lakes have a total area of 214,861 acres. Only those portions of lakes Barkley, Kentucky, and Dale Hollow lying within Kentucky were included in the total. Tennessee reports on those portions within its borders. Of the total, 57 percent (122,923 acres) were eutrophic while 29 percent (62,296 acres) were oligotrophic and 14 percent (29,642 acres) were mesotrophic.

Lake Pollution Control Procedures

Kentucky utilizes several approaches to control pollution in its publicly owned lakes. The approach chosen is dependent upon the pollutant source and the characteristics of each lake. Point sources of potential pollution are more controllable than nonpoint sources. The following procedures are routinely used to control point sources of pollution.

Permitting Program

A lake discharge guidance procedure is in effect and is applied to any new construction permit for a facility which proposes to discharge into a lake, or for any application for a lake discharge permit under the Kentucky Pollutant Discharge Elimination System (KPDES). An applicant is required to evaluate all other feasible means of routing the discharge or to explore alternate treatment methods which would result in no discharge to a lake. As a last resort, a lake discharge may be permitted. Permits for domestic wastes require secondary treatment and a discharge into the hypolimnion in the main body of the lake. More stringent treatment may be required depending upon lake characteristics. Surface discharges are not allowed. A permit may also be denied to a prospective discharger if the discharge point is within five miles of a domestic water supply intake.

Water Quality Standards Regulations

Kentucky has not adopted specific criteria to protect lake uses. Warmwater aquatic habitat, domestic water supply (if the lake is used for this purpose), and primary and secondary contact recreation criteria are generally applicable to lakes. In specific cases, a provision in the water quality standards regulation can be utilized to designate a waterbody as nutrient limited if eutrophication is a problem. Point source dischargers to the lake and its tributaries can then have nutrient limits included in their permits.

Lakes which support trout are further protected by another provision which requires dissolved oxygen in waters below the epilimnion to be kept consistent with natural water quality.

Kentucky is not planning to adopt statewide criteria specifically for lakes. A site-specific approach to lake pollution control is more realistic and feasible.

Specific Lake Legislation and Local Initiatives

The Kentucky General Assembly has the prerogative to pass legislation to protect lakes. This has been done for Taylorsville Lake. House Joint Resolution No. 4 prohibits issuing any discharge permits which allow effluents to be directly discharged into the lake. It also prohibits issuing any permits which allow inadequately treated effluents to be discharged into contributing tributaries that drain the immediate watershed of the lake. In addition, wastewater permit applications in the basin above the lake must be evaluated to ensure that discharges will not adversely affect the lake or its uses. Other provisions provide for stringent on-site wastewater treatment requirements, promotion of nonpoint source controls, and proper management of sanitary landfills in the watershed.

Lake protection associations are not formally organized in Kentucky. This is one mechanism which has proven to be successful in preventing lake pollution in other states. Local ordinances can be passed which restrict land use activities and on-site treatment systems and lead to pollution abatement. Local grass roots opposition to activities which may degrade lakes can lead to state agency action. An example is the petition process in the state's surface mining regulations which can lead to lands being declared unsuitable for mining. Such a petition has been successfully made to protect the water quality of Cannon Creek Lake in Bell County. The lake is used as a water supply for the City of Pineville and is also used for fishing and recreation.

Lake Monitoring

Monitoring water quality in lakes is a part of Kentucky's ambient monitoring program and is described in Chapter 4. The objectives of the monitoring program are flexible so that lakes can be monitored for several purposes. These include:

- detection of trends in trophic status
- impacts of permit decisions
- ambient water quality characterization
- nonpoint source impacts
- long-term acid precipitation impacts
- pollution incidences such as fish kills and nuisance algal blooms
- new initiatives such as fish tissue analysis for toxics and fecal coliform surveys in swimming areas.

Lake Restoration Plan

Kentucky has not developed a formal state Clean Lakes Program. Several states have adopted a program modeled after the federal Clean Lakes Program and have had state funds appropriated to aid in lake restoration projects. The impetus for developing these programs has been the historical importance of lakes as recreational and aesthetic resources in these states. Pollution or the potential for pollution has prompted support for state development of these programs. Pollution of lakes in Kentucky has not reached a point where there is a recognized need to develop a state program of this nature.

The Division of Water does participate in the federal Clean Lakes Program. The Natural Resources and Environmental Protection Cabinet is the state agency designated by the Governor to receive federal assistance under this program. Kentucky has received two assistance awards. One helped to fund a project which classified lakes in the state according to trophic status and assessed their need for restoration. The other award helped to fund a diagnostic/feasibility study of McNeely Lake in Jefferson County.

The Division of Water cooperated with local and federal agencies in both of these projects and prepared a grant for implementation of the restoration plan for McNeely Lake. The grant was not awarded because it was technically not eligible for assistance under federal guidelines. However, Jefferson County passed a bond issue to finance the implementation of the plan. It was completed in December of 1988. The Division will continue to monitor the lake as part of its ambient program to document water quality improvements.

The Division of Water is ready to cooperate with local agencies and other interested groups to participate in the federal Clean Lakes Program. The preparation of this assessment report is a requirement for future participation in that program.

Toxic Substance Control/Acid Mitigation Activities

Kentucky does not have publicly owned lakes which have high acidity that is caused by acid precipitation, consequently this requirement does not apply and will not be addressed.

Identification of Impaired and Threatened Lakes

Table 20 summarizes information on use support for Kentucky lakes. This information was gathered from published annual reports produced by the COE on reservoirs which they manage, from research reports by other investigators, and from Division of Water data bases. The total acres assessed are equal to the acres monitored. The analysis is based on chemical data relating to iron, manganese, dissolved oxygen problems, biological data relating to algal biomass (blooms), algae causing taste and odor problems, macrophyte infestations, and fish kill reports. Kentucky has not derived water quality standards specifically for lakes. Consequently, criteria were developed based on other indicators of lake use support (see Table 21). One of the criteria for support of aquatic life was changed to indicate that a use was not being fully supported if the average dissolved oxygen concentration within the epilimnion was less than 5 mg/l. Previously, one value within the epilimnion below 5 mg/l would have placed a lake in a nonsupport category. Lakes were reassessed using this new criteria and this resulted in some lakes being removed from the nonsupport tables. In addition, Barren River and Cave Run lakes, which had been listed as partially supporting a domestic water supply use in the previous 305(b) Report, were removed because they are not directly used as water supplies. Their releases affect downstream uses and this is more correctly addressed in the streams and rivers assessment. This action is largely responsible for the difference between relative causes and sources in this report and the 1988 305(b) Report.

Table 20
Summary of Lake Use Support

Degree of Use Support	Assessment Basis (Monitored)	Total Assessed
Acres Fully Supporting	100,910	100,910
Acres Threatened	94,839	94,839
Acres Partially Supporting	15,362	15,362
Acres Not Supporting	3,750	3,750

Acres Assessed - 214,861
Total Kentucky Lake Acreage - 228,385

There are no known published data on the total lake acreage in Kentucky. The total reported in Table 20 is based on the Division of Water's Dam Inventory Files and the acres inventoried in the lake classification program. The assessed acres represent over 90 percent of the publicly-owned lake acreage in the state. Lakes have not specifically been classified by use in Kentucky, although proposed uses are included in revisions to Kentucky's water quality standards. These have not been formally adopted at this time. Waters not specifically listed by use in water quality regulations are generally classified for the uses of warmwater aquatic habitat, primary and secondary contact recreation, and domestic water supply at points of withdrawal. Lake use support is based on these uses. Primary contact recreation was not assessed because the primary indicator of use support (fecal coliform bacteria) was not measured as part of agency monitoring programs.

Table 21
Criteria for Lake Use Support Classification

	Uses		
	Warmwater Aquatic Habitat	**Secondary Contact Water Recreation**	**Domestic Water Supply**
Not Supporting:	At least two of the following: 1. Fish kills caused by water quality 2. Severe hypolimnetic oxygen depletion 3. Dissolved oxygen average less than 5 mg/l in the epilimnion	1. Widespread excess macrophyte /macroscopic algal growth or 2. Chronic nuisance algal blooms	1. Chronic taste and odor complaints caused by algae or 2. Chronic treatment problems caused by water quality
Partially Supporting:	1. Dissolved oxygen average less than 5 mg/l in the epilimnion or 2. Severe hypolimnetic oxygen depletion or 3. Other specified cause	1. Localized or seasonally excessive macrophyte/ macroscopic algal growth or 2. Occasional nuisance algal blooms or 3. High suspended sediment concentrations during the recreation season	1. Occasional taste and odor complaints caused by algae or 2. Occasional treatment problems caused by water quality
Fully Supporting:	1. None of the above	1. None of the above	1. None of the above

Table 22
Lakes Not Supporting Uses

Lake	Use Not Supported*	Criteria	Cause	Source
Corbin	DWS	1	Nutrients	Municipal point sources and agricultural nonpoint sources
Jericho	WAH	2,3	Nutrients	Agricultural nonpoint sources
Loch Mary	DWS	2	Metals (Mn) and other inorganics (noncarbonate hardness)	Surface mining (abandoned lands)
McNeely	WAH	1,2,3	Nutrients	Municipal point sources (package treatment plants)/Inlake sediments
Reformatory	WAH	1,2,3	Nutrients	Animal holding /management areas
Sympson	DWS	1	Nutrients	Agricultural nonpoint sources
Taylorsville	WAH	1,2,3	Nutrients	Municipal point sources and Agricultural nonpoint sources

*WAH - Warmwater Aquatic Habitat, SCR - Secondary Contact Recreation, DWS - Domestic Water Supply

Detailed information on formerly assessed lakes can be found in the report on the lake classification program entitled Trophic State and Restoration Assessments of Kentucky Lakes, which was published in 1984 by the Division of Water. Detailed information on newly assessed lakes will be included in the final report of the lake assessment project. Appendix C lists summary information on all of the lakes assessed.

Table 22 and Table 23 list lakes according to whether their uses are not supported or are partially supported. The tables indicate which criteria from Table 21 were used to determine nonsupport or partial support and the probable causes and sources for the support not being achieved. Table 24 lists those lakes which fully support their uses.

Ninety-one percent of the total acres assessed supported uses while nine percent did not fully support uses. All of the ten lakes over 5,000 acres in size fully supported uses. More than half of the small lakes fully supported their designated uses (52 of 89).

Only one of the lakes listed in this report as not supporting particular uses or as partially supporting uses, is degraded to the extent that fishing and swimming are precluded. Hazards to human health through consumption of fish or swimming in waters contaminated by bacteria were not considered as problems in any of the listed lakes. The one lake, Cranks Creek, partially supports the fishable/swimmable goals of the Clean Water Act because of low pH caused by acid mine drainage. Assessed acres which support the fishable/swimmable goals of the Act equal 214,642. Fishable/swimmable goals are partially supported in 219 acres (Cranks Creek Lake).

EPA guidance asks for a list of threatened lakes. These are defined as lakes which fully support uses now, but may not in the future because of anticipated sources or adverse trends of pollution. Table 20 indicates the total acres classified as threatened. Table 25 lists the lakes and indicates what uses are threatened and the causes and sources of the threat.

Table 26 indicates the causes responsible for nonsupport of lake uses. Nutrients cause the greatest percentage of nonsupport and affect the largest number of lakes. Nutrients can stimulate a proliferation of algae, which may cause taste and odor problems in lakes used for domestic water supplies. Dissolved oxygen can also be lowered in surface waters by very productive algal populations which stimulate microbial respiration. This may result in fish kills or decrease oxygen to levels that are not conducive to the support of healthy populations of fish. Metals are the second largest contributor to nonsupport of uses. This is largely due to iron and manganese affecting lakes used for domestic water supplies. These metals are solubilized from lake sediments under anoxic conditions and cause water treatment problems. Suspended solids (the next largest contributor to nonsupport of uses) cause several reservoirs in eastern Kentucky to not fully support secondary contact recreational uses. Major and minor impacts from these causes were not differentiated. The criteria used in the assessments would categorize these causes as major impacts. Priority pollutants (toxics) did not cause any of the lake use impairments.

Table 27 indicates the sources responsible for nonsupport of lake uses. Agricultural sources are the single source responsible for the highest percentage of use nonsupport (31%). Nonpoint sources including agriculture account for the highest

Table 23

Lakes Partially Supporting Uses

Lake	Use*	Criteria	Cause	Source
Buckhorn	SCR	3	Suspended solids	Surface mining
Briggs	SCR	2	Nutrients	Lake fertilization
Campbellsville	WAH	1	Nutrients	Agricultural nonpoint sources
Caneyville	DWS SCR	1 1	Nutrients Nutrients	Natural Natural
Carpenter	SCR	1	Shallow lake basin	Natural
Carr Fork	SCR	3	Suspended solids	Surface mining
Cranks Creek	WAH	3	pH	Mining
Dewey	SCR	3	Suspended solids	Surface mining
Fishtrap	SCR	3	Suspended solids	Surface mining
Guist Creek	DWS WAH	1 1	Nutrients Nutrients	Agricultural nonpoint sources
Herrington	WAH	1	Nutrients	Muncipal, Agricultural nonpoint sources, Septic tanks
Honker	WAH	1	Nutrients	Natural
Kincaid	WAH	1	Nutrients	Lake fertilization
Kingfisher	SCR	2	Nutrients	Lake fertilization
Laurel Creek	DWS	1	Nutrients	Natural
Laurel River (Headwaters)	SCR	2	Nutrients	Municipal point sources and Agricultural nonpoint sources
Lewisburg	SCR	1	Shallow lake basin	Natural

Table 23 (Continued)

Lake	Use*	Criteria	Cause	Source
Liberty	DWS	2	Metals (Fe and Mn)	Natural
Martins Fork	SCR	3	Suspended solids	Surface mining
Marion County	SCR	2	Nutrients	Lake fertilization
Metcalfe County	SCR	1	Shallow lake basin	Natural
Morris	DWS	1	Nutrients	Agricultural nonpoint sources
Rough River	DWS	2	Metals (Mn)	Natural
Salem	SCR	1	Shallow lake basin	Natural
Sand Lick Creek	WAH	1	Nutrients	Agricultural nonpoint source
Shelby	WAH	1	Nutrients	Agricultural nonpoint sources
Spa	WAH	1	Nutrients	Agricultural nonpoint sources
Stanford	DWS	1	Nutrients	Natural
Wilgreen	WAH SCR	2 2	Nutrients Nutrients	Septic tanks Septic tanks
Williamstown	WAH	1	Nutrients	Agricultural nonpoint sources

*WAH - Warmwater aquatic habitat, SCR - Secondary contact recreation, DWS - Domestic water supply

Table 24
Lakes Fully Supporting Uses

Size		
5000 Acres or Larger	Less than 5000 Acres	
Barkley	A.J. Jolly	Linville
Barren	Arrowhead	Long Pond
Cave Run	Beaver	Long Run
Cumberland	Bert Combs	Luzerne
Dale Hollow	Beshear	Malone
Green	Blythe	Mauzy
Kentucky	Boltz	Metropolis
Laurel River (except for headwaters)	Buck	Mill Creek (Monroe Co.)
Nolin	Bullock Pen	Mill Creek (Powell Co.)
	Burnt Pond	Moffit
	Campton	Paintsville
	Cannon Creek	Pan Bowl
	Carnico	Peewee
	Chenoa	Pennyrile
	Corinth	Providence City
	Doe Run	Scenic
	Elmer Davis	Shanty Hollow
	Energy	Smokey Valley
	Fish	Spurlington
	Fish Pond	Swan Pond
	Flat	Turner
	Freeman	Tyner
	General Butler	Washburn
	George	Willisburg
	Grapevine	Wood Creek
	Grayson	
	Greenbo	
	Greenbriar	
	Hematite	

Table 25
Threatened Lakes

Lake	Use* Threatened	Cause	Source
Kentucky	SCR	Macrophyte infestations	Natural or introduced exotic species
	WAH	Low dissolved oxygen	Unspecified nonpoint sources
Paintsville	WAH	Salinity/brine	Petroleum activities
Barkley	SCR	Suspended solids	Unspecified nonpoint sources

*SCR - Secondary Contact Recreation, WAH - Warmwater Aquatic Habitat

Table 26

Causes of Use Nonsupport* In Lakes

Cause	Number of Lakes Affected	Acres	% Contribution (by Acres)
Nutrients	24	8,748	46
Metals (Fe/Mn)	3	5,314	28
Suspended solids	5	4,517	24
Other (Shallow lake basin)	4	236	1
pH	1	219	1
Other inorganics (noncarbonate hardness)	1	135	< 1

*Nonsupport is a collective term for lakes either not supporting or partially supporting uses

Table 27

Sources of Use Nonsupport* in Lakes

Source	Major Impact (Acres)	Moderate/Minor Impact (Acres)
Point Sources		
Municipal	6,041	455
Nonpoint Sources		
Agriculture	8,182	
Resource Extraction	4,862	
Septic tanks	169	
Other		
Lake fertilization	252	
Natural	5,814	

*Nonsupport is a collective term for lakes either not supporting or partially supporting uses

percentage of lake uses not being supported (51%). Municipal point sources were responsible for 25 percent of the use nonsupport, followed by natural causes which accounted for 23 percent of use nonsupport.

More detailed studies in watersheds of the lakes in the agriculture category are necessary before contributing sources of nonpoint pollution can be distinguished. Surface mining for coal (resource extraction) is the next greatest contributor to lake uses not being fully supported. Lake recreational uses are impaired because waters become turbid after receiving runoff water laden with sediment from lands disturbed by surface mining activities. This reduces the incentive for secondary contact uses.

Water Quality Trend Assessment

Trophic Trends

One of the objectives of the ambient monitoring program is to assess eutrophication of Kentucky lakes. The monitoring strategy is to obtain at least two years of data during the growing season on each lake. After the data is assessed, a decision is made either to continue monitoring or to assess another lake.

A review of current lake data from the ambient monitoring program, data retrieved through STORET on COE managed lakes, data from the lake assessment program, and other reports resulted in an assessment of trophic trends at several lakes. As mentioned earlier, a change in the chlorophyll TSI value (averaged over the April - October growing season) of 10 units was used to indicate a trophic change. A discussion of trends from the above databases follows.

Lakes in the Assessment Program. TSI values were compared for those lakes assessed in 1981-1983 which had been resurveyed in 1989. Comparisons of two data sets does not provide a strong trend analysis because the intervening years were not sampled. They do, however, indicate a change. The comparisons, as noted in Table 13, showed that Spurlington, Campbellsville City, Jericho, Doe Run, and Wood Creek lakes were more eutrophic. Lake Jericho's change resulted in its warmwater aquatic habitat use not being supported. Wood Creek Lake changed from an oligotrophic to a mesotrophic state. No uses were impaired. Honker Lake changed from a eutrophic to a mesotrophic state.

Lakes in the Ambient Monitoring Program. The following is a discussion on individual lakes which have been monitored over several years by the Division of Water, the COE, and other researchers. Analyses are based on the combined databases. Trophic trends are indicated by a change in TSI values of 10 units or greater. The extent of these databases gives the trend assessments a high level of confidence.

Green River Lake. COE data from 1981 indicated that this lake might be changing from a mesotrophic to a eutrophic state. Subsequent sampling in 1985 and 1986 by the DOW showed the main body of the lake to be mesotrophic. The 1989 COE data indicated that the lake was eutrophic. The TSI value changed from 44 (mesotrophic) to 55 (eutrophic). Monitoring by the COE will indicate if this eutrophic trend continues.

Nolin River Lake. The 1988 305(b) Report indicated that this lake was changing from a mesotrophic to a eutrophic state. The period of record showed the lake to be mesotrophic from 1975 through 1983 (TSI average was 44). Data from 1982 through 1987 showed an eutrophic trend. The TSI value was 55 in 1987. The DOW last monitored the lake in 1988 and verified that the lake was eutrophic (TSI was 52).

Carr Fork. This lake has historically been oligotrophic. TSI values before 1981 averaged 37. A lake fertilization program conducted by the Kentucky Department of Fish and Wildlife Resources to increase fishery potential caused the lake to become eutrophic from 1981 through 1985. A decrease in fertilization dosages resulted in a change to a mesotrophic state in 1986. Data from 1988 and 1989 revealed that the lake was once again eutrophic (average TSI was 53).

Reformatory Lake The Division of Water classified this lake as hypereutrophic in the 1984 305(b) Report. Its use as a recreational fishing resource was impaired because of severe hypolimnetic oxygen depletion and low dissolved oxygen in the epilimnion. Nutrients from livestock operations in the watershed were suspected of being the major cause of the lake's trophic state.

In order to alleviate what had become a potentially serious eutrophication problem, Division of Water staff met with the managers of the livestock operations and, with assistance from staff of the University of Kentucky's Agriculture Extension Service, suggested that better waste handling practices be instituted. The managers were cooperative, and steps were taken to handle the livestock waste in several of the suggested ways.

The Division began monitoring the lake in 1985 to determine if lake water quality had improved after the implementation of these better management practices. Preliminary data from 1985 indicated that the measures taken by the farm managers had dramatically improved lake water quality. Average spring through fall data showed that in the surface waters, there was 77 percent less chlorophyll *a* in 1985 than in 1981. This resulted in greater water clarity (the Secchi depth doubled) and a doubling of the depth of the euphotic zone. There was 78 percent less total phosphorus and a 59 percent decrease in total nitrogen. Dissolved oxygen remained above 5 mg/l in the upper water column in 1985, in contrast to 1981 when the concentration in the surface water declined to 2.4 mg/l. Hypolimnetic oxygen depletion occurred at a lower rate in 1985, and concentrations did not decline below 1.0 mg/l as they had in 1981. The lake was no longer considered hypereutrophic, based on an average TSI value decline of 15 points from 72 to 57.

The lake was monitored in 1986 and 1987 to verify that the improvements were sustained. It appeared that this had not occurred. The 1987 data showed that chlorophyll *a* had increased to near 1981 concentrations, water clarity had declined, and euphotic zone depths were back to 1981 values. Dissolved oxygen was again below 5 mg/l in the epilimnion and there was severe hypolimnetic oxygen depletion. The lake was hypereutrophic in the summer and fall. It was placed on the list of lakes that did not support their uses in the 1988 305(b) Report. Monitoring of the lake continued in 1988 and 1989. That data indicated conditions had changed and caused water quality to worsen. Total phosphorus averaged 117 ug/l in the spring through fall period in 1989 which is more than twice the value found in 1986. The TSI value was 77 compared to 53. The lake had shifted from an eutrophic to a hypereutrophic state. A recent farm site visit indicated no drastic changes in management practices. Causes of the deterioration in water quality are presently being investigated.

McNeely Lake. This lake no longer has problems from excessive duckweed growth, because grass carp introduction has effectively eliminated the duckweed. The lake is, however, still eutrophic, has severe epilimnetic and hypolimnetic oxygen depletion, and has reported fish kills. It is still considered as not supporting a warmwater aquatic habitat use. The discharges from package treatment plants in the watershed were piped to the stream below the lake outlet structure in December of 1988. This has caused a noticeable improvement in water quality and should eventually restore the warmwater aquatic habitat use. Phosphorus concentrations have declined. The average TSI in 1989 was 65 (eutrophic), which was a decrease of 9 units from the 74 (hypereutrophic) value in 1988.

Other Trends in Water Quality

Cave Run Lake. This lake was previously listed as threatened by brine pollution from petroleum activities (oil well operations) in its watershed. Chloride levels monitored by the COE indicated a steady increase in concentration beginning before 1981. Water column data at the dam for the years 1974-1976 showed a mean chloride concentration of 4 mg/l. In 1981 the mean was 10 mg/l, in 1983 it was 13 mg/l and by 1986 it was 22 mg/l (four and one-half times greater than the 1974-1976 levels). Chloride data from the Licking River, the main inflow to the lake, showed a similar trend but with much higher concentrations. The average chloride concentration from 1972 to 1976 was 9 mg/l. In 1981 it was 23 mg/l and in 1983 it was 57 mg/l. The concentration peaked in 1985 with an average of 200 mg/l. The 1986 average concentration declined slightly to 158 mg/l. The 1985 average was 21 times greater than the 1972 - 1976 levels.

COE data from 1987 showed a decline at the dam station to 13 mg/l which was coupled with a Licking River decline to 42 ug/l. Too few measurements were reported in 1988 and 1989 to indicate further trends. The lake has been removed from the threatened list of lakes as a result of the 1987 data assessment. It is hoped that the COE will provide continued monitoring for chlorides to indicate further water quality changes in the lake.

Cranks Creek Lake. Serious declines in pH in this lake were reported by the Kentucky Department of Fish and Wildlife Resources (KDFWR) in 1988. The source was determined to be periodic acid mine drainage. Declines in pH followed periods of low flow in tributary streams when available dilution was low and acid mine discharges became the major source of flow. An organization called "Living Lakes" has undertaken restoration of the lake in cooperation with the KDFWR. They are liming the lake at scheduled times to neutralize the acid impacts. The DOW has been contacted and approved the restoration efforts. A cooperative effort between DOW and KDFWR is planned to address the feasibility of eliminating the acid mine drainage problem.

Dale Hollow Reservoir. Tributary streams to Dale Hollow Reservoir were monitored for the COE in 1985 by Dr. John Gordon of Tennessee Technological University. The objective of the monitoring was to identify any problem areas which might threaten the high levels of water quality in the lake. Results of the monitoring effort indicated that at least three streams on the Kentucky side of the lake had water quality problems relating to brines from oil and gas production areas. The DOW monitored the embayments that these creeks flowed into (along with three other embayments on the Kentucky side) in 1987 and 1988. The objective was to determine if these embayments were being impacted by stream inputs. Measurements were made for chlorides and sulfates to determine if oil field pollutants were changing water quality. Chlorophyll a and nutrient measurements were also taken to assess the trophic state of the embayments. Results showed minimal increases in chloride concentrations in the Illwill Creek and Little Sulphur Creek embayments, when compared to control embayments. These were the embayments linked to streams flowing through oil production areas. Increases in chloride concentrations were 2 to 3 mg/l above controls. The embayment of Spring Creek had an increase of 10 to 13 mg/l chloride over controls. It was also eutrophic while the other embayments were mesotrophic or oligotrophic. The eutrophic state and higher chloride concentration are attributed to the discharge of municipal wastes to Spring Creek, from the City of Albany. Embayment recreational and aquatic life uses were, however, fully supported.

CHAPTER 3

WATER QUALITY ASSESSMENT OF GROUNDWATER

WATER QUALITY ASSESSMENT OF GROUNDWATER

Public concern for groundwater has increased nationwide and Kentucky is no exception. Currently, information on the state's groundwater resource is lacking and this can prove detrimental to protection and allocation efforts. The lack of data hampers Kentucky's groundwater protection goal, which is to maintain and protect the resource for its highest and best use and to minimize or prevent degradation.

Ambient groundwater quality has been determined in some local areas through special projects and cooperative efforts, but groundwater quality for the majority of the state remains unknown. Groundwater quantity and availability also remain largely unaddressed. There is an immediate need in Kentucky for a comprehensive aquifer mapping and groundwater classification program. Resource limitations have prevented concentrated effort on such a program, but the Division of Water is directing its efforts toward such a program. Assistance from other agencies, including the Kentucky Geological Survey, and the United States Geological Survey will be needed in order to implement a comprehensive mapping and classification program.

The protection of groundwater in the Commonwealth of Kentucky presents unique problems not encountered by many states. The hydrogeologic characteristics of karst areas must be determined on a case-by-case basis. Additionally, the majority of the federal technical assistance and guidance is not applicable to karst areas.

Sources and Contaminants in Groundwater

Table 28 presents the major sources of groundwater contamination in the state and ranks the top five sources (number one being the most serious). Table 29 lists those substances contaminating groundwater in the Commonwealth from the sources listed in Table 28.

Proposed Environmental Indicators

In this report, Kentucky has attempted to assemble the data necessary to respond to a set of environmental indicators proposed by the U.S. Environmental Protection Agency (EPA) in their 305(b) guidance document. In doing so, gaps and/or inconsistencies in the data necessary to fully address or respond to some of the proposed indicators have been identified. For other indicators, Kentucky's programs are not yet to the point where the requested data can be collected.

Tables 30 and 31 utilize suggested indicators from groundwater-supported public water supplies. Table 30 contains the number of groundwater-supported public water supplies with Maximum Contaminant Level (MCL) violations. These violations represent contaminants detected in the finished water and may or may not be indicative of groundwater quality. Table 31 contains the groundwater-supported public water supplies that had volatile organic compounds detected during at least one quarterly sampling event. This data is representative of groundwater quality problems, but as yet cannot be used to indicate a trend in groundwater quality because each water supply is only included in the quarterly sampling program for one year. In other words, this data only indicates contamination. 1988 data cannot be compared to 1990 data to indicate trends. Additionally, this table only contains data for regulated volatile organic compounds and does not consider unregulated organic compounds.

Table 28
Major Sources of Groundwater Contamination

Source	Relative Priority
Septic tanks	2
Municipal landfills	
On-site industrial landfills (excluding pits, lagoons, surface impoundments)	
Other landfills	
Surface impoundments (excluding oil and gas brine pits)	
Oil and gas brine pits	5
Underground storage tanks	1
Injection wells (inc. Class V)	
Abandoned hazardous waste sites	3
Regulated hazardous waste sites	
Salt water intrusion	
Land application/treatment	
Agricultural activities	
Road salting	
Improper well construction	4

Table 29
Substances Contaminating Groundwater

Organic chemicals:		Metals	X
Volatile	X*	Radioactive material	X
Synthetic	X	Pesticides	X
		Other agricultural chemicals	X
		Petroleum products	X
		Other (bacteria)	X
Inorganic chemicals:			
Nitrates	X		
Fluorides			
Arsenic	X		
Brine/salinity	X		

*Substances present

The Comprehensive Environmental Response, Compensation and Liability Act (Superfund or CERCLA) waste disposal sites present two problems for use in groundwater quality assessment. First, the National Priority List (NPL) sites are only a small subset of sites with contamination. In Kentucky, 500 plus sites are on the CERCLA list, yet only 250 have had a preliminary assessment/site investigation. Additionally, 65 sites have confirmed hazardous waste or contamination on site but do not score high enough to be placed on the National Priority List (NPL). The second major issue is the lack of complete information at the state level. The Superfund program is not delegated to states. EPA manages the Superfund program and maintains the official files and information on each NPL site. Of the 17 NPL sites in Kentucky, three sites have groundwater contamination but Kentucky has not been furnished the data. Four of the NPL sites have had no sampling and on three sites Kentucky has no information. The information requested is not available at the state level so this indicator could not be utilized.

The guidance also suggested the use of Resource Conservation and Recovery Act (RCRA) hazardous waste disposal site information for assessment of groundwater quality trends. Kentucky would suggest that all RCRA facilities be included in the water quality assessment report. Storage facilities have contaminated groundwater as a result of spills or solid waste management units. As more RCRA facilities perform RCRA Facility Assessments and RCRA Facility Investigations, more accurate information on groundwater impacts will be available. The categories of contaminants should indicate which RCRA waste would be included in each category. Tables 32 and 33 compile available information in the format requested in the federal guidance. Interpretation of the tables is limited by the lack of off-site information indicating groundwater contamination from these sites. The tables are provided to indicate known contaminants from RCRA sites in Kentucky.

Table 30
Number of Groundwater Supported Public Water Supplies (PWS)
with MCL* Violations

MCL Parameter	No. PWS with MCL Violations 1988	1989
Turbidity	1	5
Barium	1	0
Fluoride	3	3
Nitrate	1	0
Selenium	0	0
Trihalomethanes	0	0
Bacteria	25	33

*MCL = Maximum Contaminant Level

Table 31
Groundwater Supported Public Water Supplies (PWS)
with Volatile Organic Chemical Contamination

Volatile Organic Compound	Number of PWS with Contaminant Detected during at least 1 Quarterly Sampling	Concentration (micrograms/ liter)			
		Min. Value	Max. Value	Avg. Value	MCL Value
1989					
1,4-dichlorobenzene	10	0.001	0.011	0.003	0.075
1,1,1-trichloroethane	6	0.001	0.083	0.019	0.002
1,2-dichloroethylene	1	0.002	0.003	0.002	0.007
Carbon Tetrachloride	1	0.003	0.003	0.003	0.005
Vinyl Chloride	1	0.010	0.010	0.010	0.002
1988					
1,4-dichlorobenzene	5	0.001	0.003	0.002	0.075
1,1,1-trichloroethane	2	0.001	0.019	0.008	0.200
Trichloroethylene	2	0.001	0.003	0.002	0.005
Carbon Tetrachloride	2	0.001	0.014	0.008	0.005

Table 32
RCRA Hazardous Waste Site Groundwater Contaminants
(1989)

Contaminant	Total Wells (On-Site)	Concentration Level Status[1]				Total Wells (Off-Site)	Concentration Level Status[1]			
		0	1	2	3		0	1	2	3
Polychlorinated biphenyls	7		5		2	1				1
Pesticides	5		5							
Other organics	24		4	6	13	5			1	4
Metals	23	1	7	13	6	2			1	1
Bacteria	2		2							
TOC. TOX.*	3									
Cyanide	1			2						
Radioactivity	2			6			6			

1. Concentration Level Status 0 = unknown, 1 = at or below detection limit, 2 = above detection limit, 3 = above level of concern (above MCL if MCL exists)
*TOC. = Total organic carbon
TOX. = Total organic halogens

Table 33
RCRA Subtitle D Waste Disposal Site
(Landfills) Groundwater Contaminants
(1989)

Contaminant	Total Wells (On-Site)	Concentration Level Status[1]			
		0	1	2	3
Polychlorinated biphenyls	NA	-			
Pesticides	0	-			
Other organics	6	-		5	1
Metals	31	-		21	10
Conventional	32	-		32	
Bacteria	7	-	5	2	

[1]Concentration Level Status 0 = unknown, 1 = at or below detection limit, 2 = above detection limit, 3 = above level of concern (above MCL if MCL exists)

"Conventional contaminants" was not defined in the guidance. Therefore, Kentucky used this category to represent secondary drinking water quality standards. A few wells have been sampled off-site at landfills; however, this information has not been compiled. Of the 187 landfills permitted in Kentucky, 59 solid waste sites submit groundwater analyses to the Division of Waste Management. Only 15 of these are required to submit organic analysis. These data represent information collected over more than one year.

Special Studies

DRASTIC Model Evaluation

The Institute for Mining and Minerals Research, University of Kentucky, conducted a study to evaluate the suitability of the DRASTIC Method for assessing the vulnerability of groundwater to contamination. The DRASTIC Method uses depth to water, net recharge, aquifer media, soil media, topography, impact of the vadose zone, and hydraulic conductivity of the aquifer to determine the vulnerability of groundwater to surface contamination.

The study was designed to evaluate the applicability of the DRASTIC Method in Kentucky; evaluate information existing on the Kentucky Natural Resources Information System (KNRIS); and evaluate and estimate the cost of a statewide DRASTIC mapping program.

Kentucky is faced with the problem of addressing groundwater protection in karst areas. An objective of this study was to assess the applicability of DRASTIC in karst areas. Many of the parameters used in the DRASTIC method are not representative of the real world mechanisms which contribute to the vulnerability of a karst aquifer to contamination. For instance, the method assigns a lower value to the model for pollution potential as the depth to water increases. However, in karst areas, depth to water may not be a critical parameter to aquifer protection because the contaminants can enter the aquifer directly through solutional openings and fractures which intercept surface and shallow subsurface flow. As another example, in karst areas dilution may be the most significant attenuation mechanism, but this mechanism is ignored by the net recharge parameter.

As part of the study, each map produced was assigned a confidence level. The confidence level is based on the confidence in the information used to determine the DRASTIC Index. Most of the data necessary to produce a map of DRASTIC Indexes does not exist on the KNRIS. A vast amount of time and manpower was spent digitizing geologic maps, soil survey maps and water well information in order to use the Geographic Information System to produce the DRASTIC Index maps. The confidence level for the final DRASTIC maps ranged from 52 to 95 percent. The cost of mapping Kentucky using the DRASTIC Method is estimated at $2 million, and then the maps would only be suitable for a first-cut analysis, not actual permitting or response decisions. The final report, "DRASTIC Analysis for Application by State Government," concludes that the data currently available in Kentucky is marginally acceptable and difficult to access.

The DRASTIC Method is designed to adequately assess the vulnerability of granular aquifers, but many of the attenuation processes in the model are not active in karst areas.

Kentucky Pilot Wellhead Protection Study

Personnel from the University of Kentucky, Department of Geological Sciences, conducted a pilot wellhead protection project in Kentucky. The project was designed to identify and evaluate existing data sources and their utility in identifying potential sources of contamination. The objectives of the study were to: delineate wellhead protection areas for the cities of Georgetown, Elizabethtown, and Calvert City; to identify the potential sources of contamination within the wellhead protection areas; and to gain experience in the development and application of the Wellhead Protection Program in Kentucky.

A wellhead protection area was delineated for each of the three study areas. Two study areas were located in karst areas. The third study area was located in an alluvial aquifer. Hydrogeologic mapping was chosen as the wellhead delineation method in the karst study areas (Georgetown and Elizabethtown). These areas had been the subjects of earlier hydrogeologic studies that provided information about the recharge areas of the springs that provide the public water supplies. The third study area, Calvert City, relies on wells for public water supply. The wells are drilled into an alluvial aquifer. A pumping test was conducted to determine the hydrogeologic characteristics of the aquifer. Data from the pumping test was used to delineate the wellhead protection area.

Existing databases were used to identify and assemble information on the potential contamination sources that are located within the wellhead protection area. Many obstacles were encountered in identifying the potential contamination sources. Much of the data needed to identify the sources are stored in paper files. Locations for many of the facilities are referenced by street address, not a coordinate system. Sources referenced by street address require field inspection to be accurately plotted on maps. All information gathered during this study will be provided to the participating cities along with recommendations on additional work needed to satisfy the requirements of the Wellhead Protection Program.

North Marshall Water District Pilot Project

The Division of Water is conducting a wellhead protection pilot project in Marshall County. The goal of the project is to establish a comprehensive wellhead protection plan for the North Marshall Water District. This project will allow the state to further identify resource and data needs for implementing a state program. The project will also identify the mechanisms needed to facilitate cooperation on both state and local levels.

It is expected that experiences gained by the state during this project will be used to further develop and implement the Kentucky Wellhead Protection Program. The division of program responsibilities between state and local entities will be better and perhaps more equitably accomplished by basing it on real world experiences as opposed to abstract suppositions and assumptions.

Groundwater Issues

Information Systems

Protection of groundwater resources in Kentucky is impeded by a disjointed environmental information system that is typified as containing more gaps than data. A comprehensive groundwater protection program requires more than just data on groundwater and aquifers, but also requires information on the existing threats to groundwater. State regulatory agencies do not always collect all of the necessary data or it is collected in a cumbersome format that does not lend itself to easy data retrieval and/or transfer.

Projects conducted in the last biennium have identified the need to plan and coordinate data collection and the need to improve the transfer of data between agencies. There are state programs that collect facility information, but do not require latitude and longitude location information. Street addresses are typically collected, but are useless to the state's Geographic Information System. In order for Kentucky to develop a useful Geographic Information System, location data must include latitude and longitude coordinates. When a program requires information from a regulated community, consideration should be given as to how other agencies might use the data for regulatory programs, investigative studies, and pollution control.

The Division of Water could employ computer methods to assist in mapping and characterizing the State's aquifers, but the existing Geographic Information System is too broad in scope and the data available is too general and contains too many gaps. Very few areas of the state have adequate coverage and the geologic and/or hydrogeologic information necessary to map and characterize aquifers has not been entered into the system.

Kentucky needs to follow the federal lead in adopting a minimum set of data requirements that would be collected by all regulatory programs. Establishing minimum data requirements for all programs would have the effect of giving all databases a set of common elements and would facilitate the transfer of data between programs. Establishing a standard set of minimum data elements could also help to eliminate some of the existing gaps in the data.

Contamination of Public Water Supplies

One of the most direct ways for environmental contamination to affect public health is through drinking water supplies. In 1988, the Division of Water initiated a three-year program aimed at testing all public water supplies for volatile synthetic organic chemical contamination. In 1989, approximately 140 of the water supplies tested relied on groundwater. Approximately 12 percent of the groundwater supplies tested in 1989 had some level of contamination during at least one of the quarterly testing events. The contaminant detected most often was 1, 4-dichlorobenzene, followed by 1,1,1-trichloroethane.

Over the past year the Division of Water has investigated several situations where groundwater contamination has impacted a public water supply. The Holiday Mobile Home Park Public Water Supply in Dayhoit was decommissioned in 1989 because of chemical contamination detected as part of the Volatile Synthetic Organic Chemical Monitoring Program. The source of the contamination was determined to be improper waste disposal from previous industrial activity in the vicinity. The extent of the contamination has not yet been determined. The hydrogeology of the Dayhoit area is very complex and several separate water bearing zones may have been interconnected by poorly constructed water wells, complicating the task of delineating the possible migration pathways of the contamination.

The Georgetown Municipal Water and Sewer Service in Georgetown temporarily discontinued the use of Royal Spring in the Fall of 1989 because of benzene contamination. In contrast to the situation at Dayhoit, the extent of the contamination is fairly well known. Samples taken from wells penetrating various portions of the aquifer indicate that only a small part of the groundwater basin that supplies Royal Spring has been affected, but attempts to locate the contaminant's source have been unsuccessful as of this date.

These problems indicate a need for a more effective groundwater protection program and a more unified approach to groundwater protection. More emphasis needs to be placed on preventing groundwater contamination instead of remediating problems after they occur. More work needs to be done to characterize the state's groundwater resources and to insure their protection.

Uncertified Drillers

During 1989, nearly 20 percent of Kentucky's certified drillers allowed their certification to expire. Many of those drillers may still be drilling water wells. Resource limitations have prevented an effective enforcement program resulting in an increasing number of uncertified drillers. The Division of Water is concerned that an ineffective program to certify and regulate water well drillers will result in improperly constructed water wells that provide a direct route for contaminants to enter an aquifer. A proliferation of improperly constructed water wells may result in a greater frequency and magnitude of groundwater contamination incidents.

In addition, the Division only certifies the drillers of water supply wells. Standards for the construction of water supply wells in Kentucky have been in effect since 1986. In contrast, drillers that install environmental monitoring wells are unregulated. No uniform set of standards exists for the construction of monitoring wells. The Division of Water is concerned that improperly constructed monitoring wells could be contributing to groundwater contamination. The certification and education of water well drillers should be expanded to include monitoring well drillers and a set of construction standards for monitoring wells should be established. A more active enforcement and inspection program would help ensure that all wells are acceptably constructed to protect groundwater supplies and public health.

Resource Management

In 1988, Kentucky experienced a major drought. The drought and subsequent water shortages demonstrated the need for Kentucky to better manage its water resources. Water well drilling activity increased across Kentucky in an attempt to secure dependable water supplies to supplement or replace the waning surface supply. Approximately twenty of Kentucky's public water supplies that rely on groundwater implemented some type of conservation program to insure an adequate supply of water for their customers.

During the drought, groundwater was the major contributor to stream flow. Surface water supplies were greatly diminished, forcing many of the state's surface water users to implement conservation measures. The contribution that groundwater was making to stream flow was crucial in sustaining the water supply for a large portion of the state's population. Kentucky's dependence on groundwater points out a need to identify and characterize the available groundwater resource throughout the state. The geology of Kentucky lends itself to aquifers that have a very local areal extent. The hydrostratigraphy of the state does not generally support large regional aquifers. One way to accomplish the task of identifying and characterizing the groundwater resource is through a comprehensive aquifer mapping and groundwater classification program. A better understanding of the resource would aid groundwater protection programs and make the groundwater withdrawal permitting program more efficient. A comprehensive aquifer mapping and characterization program would help to ensure that available groundwater resources are properly evaluated and allocated.

Quality considerations are also of great importance in managing the resource. The natural quality of the groundwaters of many of the state's aquifers has not been adequately characterized. Kentucky needs to implement a comprehensive program to assess groundwater quality. The natural groundwater quality of the aquifers must be known in order to make aquifer classification decisions and to manage the resource for its highest and best use.

Of considerable concern is the continued practice of discharging pollutants to groundwater. The KPDES program permits wastewater discharges directly to groundwater. If this practice is to continue, effective effluent limits must be strictly maintained and enforced. Kentucky needs an aquifer protection program that will ensure that discharges to groundwater do not adversely impact the state's aquifers. Kentucky needs to implement new programs that will protect existing groundwater quality and, at the same time, step-up the enforcement of existing programs that protect groundwater quality.

Nonpoint Source Groundwater Contamination

Agriculture, mining and mineral extraction, and urban-residential development are the primary land uses in Kentucky. Many activities associated with these land uses are known to generate a great number of contaminants which have significant potential to degrade groundwater resources and adversely impact groundwater-supported drinking water supplies. However, the threat that nonpoint source contamination poses to the state's aquifers is difficult to assess because of a lack of sufficient data. At this time, few detailed studies of nonpoint pollution of groundwater in Kentucky have been conducted. There is a critical need to conduct surveys to identify particular nonpoint contaminants of greatest concern, to map areas of degraded or otherwise adversely impacted groundwater, and to investigate the migration and fate of nonpoint contaminants in the various groundwater regimes. The lack of this information greatly hinders the development of effective control and remediation measures, and impedes the establishment of an appropriate groundwater protection regulatory program for nonpoint source contamination.

Three major classes of nonpoint source pollutants are believed to be contributing to significant and potentially widespread groundwater contamination. These pollutants are: agrichemicals, especially pesticides and herbicides; chlorides and other brine constituents generated as a result of oil and gas exploration and extraction; and effluent from septic tanks, seepage pits, and other groundwater discharges.

Kentucky is principally an agricultural state. Approximately 75 percent of the state consists of karst topography, and much of this area contains extensive, heavily-cropped farmland. Although the soils are generally thick and retentive, agrichemicals such as pesticides and fertilizers applied in these areas can directly enter the groundwater system through solutional openings and fractures in the soluble carbonate bedrock.

In most of Eastern Kentucky, and in large portions of the central and western parts of the state, extensive oil and gas exploration and extraction have occurred historically and are continuing today. It is estimated that thousands of abandoned, unplugged or improperly plugged wells and exploration boreholes exist in these areas. These wells and boreholes allow cross contamination of aquifers with briny fluids, hydrocarbons, and soil waters. Other related sources of this type of nonpoint contamination include injection wells which dispose of oil field brines; secondary oil recovery techniques, particularly water-flooding and steam injection; and gas field pressurization. All of these sources can contribute to the migration of brines and hydrocarbons into aquifers supplying private and public drinking water.

Septic tank systems are the most common form of sewage treatment in rural, and in many urban, residential areas. The Cabinet for Human Resources (CHR) has estimated that 60-70 percent of Kentucky homesites are not sewered. Improperly sited or inadequately constructed septic systems may contribute nitrates, bacteria, viruses, disposed hazardous chemicals, and other pollutants to the local groundwater regime.

Concerns about the sources of nonpoint groundwater contamination, the degree and extent of impact, and the potential threat posed to the aquifers of the state are best addressed by basic research. Adequate funding necessary to support relevant scientific investigations by academic and state regulatory agencies should be provided. A comprehensive aquifer mapping and groundwater classification program is needed in order to identify groundwater resources which may be particularly vulnerable to nonpoint pollution. This program should include assessments of groundwater quality in order to identify particular contaminants of concern, evaluate existing levels of contamination, and monitor impacts of contamination on aquifers and groundwater-supported drinking water supplies throughout the state. In addition, Kentucky would benefit greatly from a comprehensive aquifer protection program which assures that important groundwater resources are not degraded or adversely impacted by nonpoint source contamination.

Federal Policy Responsibility

The U.S. Environmental Protection Agency must develop a concept for groundwater protection that will be implemented through development of a federal regulatory scenario including minimum groundwater quality standards and mandatory requirements for state programs. Additionally, EPA must integrate this overall groundwater protection strategy into the regulations promulgated under the authority of the Clean Water Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation and Liability Act, the Safe Drinking Water Act, and the Federal Insecticides, Fungicide and Rodenticide Act. EPA, not states, must take the lead in a comprehensive framework for coordinating federal programs. Since they establish minimum standards for programs that may be delegated to states and promulgate regulations for those programs that are not delegated, only EPA can ensure coordination of all programs that impact groundwater.

EPA should promulgate regulations for all of the above laws to ensure consistency in groundwater quality standards and protection measures. The states could then promulgate regulations that would ensure protection of unique, sensitive, or vulnerable areas within the state. Establishment of regulatory standards at the federal level also addresses concerns for aquifers that cross state boundaries.

CHAPTER 4

WATER POLLUTION CONTROL PROGRAMS

POINT SOURCE CONTROL PROGRAM

Wastewater Treatment Facility Permitting

Point source pollution refers to any discharge from municipal or industrial facilities that can be identified as emanating from a discrete source such as a conduit or ditch. Kentucky has a total of 6,650 facilities covered by the Kentucky Pollutant Discharge Elimination System (KPDES) program. In addition, new federal mandates require expansion of the point source program to include stormwater runoff.

Wastewater permit limits in Kentucky have been water quality-based since National Pollutant Discharge Elimination System (NPDES) program delegation on September 30, 1983. Generally, there are two approaches for establishing water quality-based limits for toxic pollutants: (1) chemical-specific limits, meaning the use of individual chemical criteria (which are derived for the protection of aquatic life) for determining discharge limits for all known toxic or suspected toxic pollutants in an effluent; or (2) whole effluent toxicity testing, which sets limits on an effluent's total toxicity, as measured by acute and/or chronic bioassays on appropriate aquatic organisms. Both approaches have advantages and drawbacks, but when both are integrated into a toxics control strategy, they provide a flexible and effective control for the discharge of toxic pollutants.

Toxicity data are available for only a limited number of compounds. Single parameter protection criteria, therefore, often do not provide adequate protection of aquatic life where the toxicity of the components in the effluent is unknown, where there are synergistic (greater than predicted) or antagonistic (less than predicted) effects between toxic substances in complex effluents; and/or where a complete chemical characterization of the effluent has not been carried out. Since it is not economically feasible to determine the toxicity of each of the thousands of potentially toxic substances in complex effluents or to conduct exhaustive chemical analyses of effluents, the most direct and cost-effective approach to measuring the toxicity of effluents is to conduct effluent toxicity tests with aquatic organisms. By the end of 1989, Kentucky had incorporated biomonitoring requirements into the permits of 66 municipal wastewater treatment plants and 35 industrial wastewater facilities.

The quality of Kentucky's surface waters continues to face a threat from improperly treated industrial waste discharged into municipal sewage treatment systems. Such waste often contains pollutants that are either not removed by the municipal treatment process or, if removed, result in the generation of contaminated sludge. In an effort to control this problem, Kentucky has approved pretreatment programs in 64 cities and has screened several others to determine their need for a pretreatment program. A list of communities with approved pretreatment programs and the estimated costs to administer the local program is presented in Table 34. The facilities needing programs are all on schedule for obtaining approval. Once approved, each program is inspected annually and must submit semi-annual status reports to the Division of Water for review. These reports are incorporated into the computer files known as the Permit Compliance System (PCS) and Pretreatment Permits and Enforcement Tracking System (PPETS).

Municipal Facilities

The Construction Grants Program has resulted in the construction of $57.8 million in wastewater projects which came on line during 1988-1989 as indicated in

Table 34
Total Estimated Level of Annual Funding Required to Implement the POTW Pretreatment Program

No.	City	$/year
1.	Adairville	6,250
2.	Ashland	73,000
3.	Auburn	2,300
4.	Bardstown	20,000
5.	Beaver Dam	12,750
6.	Berea	10,000
7.	Bowling Green	75,000
8.	Calhoun	in-active
9.	Calvert City	20,000
10.	Campbellsville	45,000
11.	Campbell/Kenton Co. SD #1	85,000
12.	Corbin	14,600
13.	Cynthiana	250
14.	Danville	8,500
15.	Edmonton	5,000
16.	Elizabethtown	115,000
17.	Eminence	5,200
18.	Frankfort	29,000
19.	Franklin	30,000
20.	Fulton	16,000
21.	Georgetown	10,000
22.	Glasgow	30,000
23.	Guthrie	16,000
24.	Harrodsburg	25,000
25.	Hartford	1,000
26.	Henderson	70,000
27.	Hopkinsville	154,000
28.	Horse Cave	10,000
29.	Jamestown - Russell County	30,000
30.	Jeffersontown	60,000
31.	Kevil	100
32.	Lancaster	4,000
33.	Lawrenceburg	16,000
34.	Lebanon	7,100
35.	Leitchfield	20,200
36.	Lexington	189,000
37.	Livermore	1,500
38.	London	6,500
39.	Louisville MSD	896,900
40.	Madisonville	30,000
41.	Marion	3,100

Table 34 (Continued)

No.	City	$/year
42.	Maysville	12,000
43.	Middlesboro	9,000
44.	Monticell	in-active
45.	Mount Sterling	12,000
46.	Murray	9,000
47.	Nicholasville	31,000
48.	Owensboro	49,000
49.	Owingsville	500
50.	Paducah	81,200
51.	Paris	30,000
52.	Princeton	12,000
53.	Richmond	23,800
54.	Russellville	5,000
55.	Scottsville	1,500
56.	Shelbyville	13,000
57.	Somerset	75,000
58.	South Campbell County	in-active
59.	Springfield	500
60.	Stanford	1,100
61.	Tompkinsville	in-active
62.	Versailles	8,000
63.	Williamstown	6,350
64.	Winchester	40,000
	TOTAL	2,573,200

Table 35. Twenty-one municipal wastewater projects were completed during this two year period. An additional 20 projects are in various stages of construction.

Significant improvements in water quality have been realized through the construction of new wastewater treatment facilities. A review was made of facilities completed during 1988-1989 which had discharges to surface waters. The discharge monitoring reports indicated significant reductions in pollutants.

Although significant improvements in water quality have been realized through the construction of new wastewater treatment facilities, there are numerous needs that remain to be addressed. The 1988 Needs Survey, conducted by the Division of Water as part of its planning process, indicated that municipal dischargers continue to impair water quality and pose potential human health problems. State and federal minimum treatment requirements are not being met in every instance. The 1988 Needs Survey identified a capital investment need of $1.11 billion to construct and rehabilitate wastewater treatment facilities and components for Kentucky, based on the 1988 population. Backlog needs of $1.11 billion, coupled with long-range needs for publicly-owned treatment facilities, reveal a projected total need of over $1.46 billion through the year 2008. A detailed breakdown of investment needs is presented in Table 36.

Table 35
Construction Grants Funded Projects Which Came on Line
During Calendar Years 1988-1989

	Date on Line	Design Flow (MGD)	Treatment Cost	Interceptors
Ashland	6/89	11.000	$16,013,289	$2,651,277
Radcliff	2/88	2.800	$ 5,137,510	$3,077,836
Lancaster	9/89	1.00	$ 1,663,500	$ 149,700
Leitchfield	4/88	1.300	0	$ 75,866
Springfield	6/88	0.464	$ 3,009,242	$ 184,224
Paintsville	5/88	0.993	$ 4,712,733	$ 115,670
Dawson Springs	9/89	0.320	$ 2,415,522	0
Fulton	9/89	0.720	$ 1,411,165	0
Hodgenville	7/89	0.289	$ 2,367,170	$ 287,551
Stanton	1/89	0.460	$ 1,816,234	0
Owenton	9/89	0.150	$ 1,916,836	0
Hardinsburg	6/89	0.110	$ 1,972,539	$ 792,284
Lancaster	6/88	0.375	$ 762,628	$ 140,081
Elkton	5/88	0.250	$ 1,319,062	$ 984,795
Vine Grove	3/89	0.714	$ 2,937,631	$1,288,704
Hanson	5/88	(Sewers)	0	$ 327,169
Taylor Mill	1/89	(Sewers)	0	$ 250,000
Totals			$47,455,061	$10,325,157

Table 36
Investment Needs for Wastewater Treatment
Facilities in Kentucky
1988-2008
(In January 1988 millions of dollars)

Facility	For Current 1988 Population	Projected Needs 2008 Population
Secondary treatment	$ 137	$ 185
Advanced secondary treatment	$ 50	$ 60
Infiltration/Inflow	$ 78	$ 78
Major rehabilitation of sewers	$ 12	$ 12
New collector sewers	$ 544	$ 671
New interceptor sewers	$ 264	$ 428
Correction of combined sewer overflows	$ 23	$ 23
Total	$1,108	$1,457

The 1986 305(b) Report to Congress described Kentucky's Water Infrastructure Report and concluded that a revolving loan fund concept was the most feasible option for Kentucky in meeting its water infrastructure needs. Because the federal law was not in place at that time, Kentucky was unable to pass appropriate legislation during the 1986 Kentucky General Assembly.

When the 100th Congress of the United States passed HR 1, this initiated the final steps toward establishment of state revolving funds. States were given the option of using a portion of the allotment for grants through FY 90. Kentucky made the decision to place all federal dollars in the revolving fund to the extent possible beginning in FY 88. A few large segmented grant projects require continuation of grant funding through FY 90. An early transition from grants to loans will assure more available dollars in the revolving loan fund over the long term.

Kentucky state legislation was passed March 14, 1988. Kentucky has received two capitalization grants from EPA. These grants of FY 88 and FY 89 federal funds total $33.2 million. Provisions have been made in the state biennial budget for the 20 percent match, and it is estimated that approximately $147 million will be available in federal and state funding through 1994 when federal funding is to cease. This should be a first step toward funding the $353 million of requests contained in the state's priority list, plus other wastewater needs which have not yet been placed on the priority list.

NONPOINT SOURCE POLLUTION CONTROL PROGRAM

The Kentucky Nonpoint Source Management Program document provides a comprehensive description of Kentucky's strategy for controlling nonpoint source (NPS) pollution. It was prepared by the Division of Water (DOW) in response to the requirements of the Water Quality Act of 1987 and received full approval from the U.S. Environmental Protection Agency (EPA) in November, 1989. It describes those control measures, or best management practices (BMPs), which Kentucky will use to control pollution resulting from each NPS category (agriculture, construction, etc.) identified in the Kentucky NPS Assessment Report (and this report); the programs to achieve implementation of those BMPs; and a schedule for implementing those programs.

Because NPS pollution arises from a wide spectrum of diffuse sources throughout the Commonwealth, a variety of programs exists in a number of agencies which address NPS pollution control. The DOW serves as the lead oversight agency for these programs. Agencies and institutions cooperating in the implementation of Kentucky's NPS Management Program include the Kentucky Division of Conservation (DOC), Division of Forestry, Division of Waste Management, Division of Pesticides, and Department for Surface Mining Reclamation and Enforcement, Kentucky Conservation Districts, Kentucky Geological Survey, U.S. Soil Conservation Service (SCS), U.S. Agriculture Stabilization and Conservation Service (ASCS), U.S. Forest Service, U.S. Geological Survey, U.S. Army Corps of Engineers, Tennessee Valley Authority, University of Kentucky Water Resources Research Institute, and University of Kentucky College of Agriculture.

To help identify new directions for Kentucky's NPS Management Program, a NPS Advisory Committee was formed with representatives from government agencies having a role in NPS pollution control; the agriculture, construction, forestry, and mining industries; and private citizens and groups concerned with environmental protection interests. Most of the Advisory Committee's recommendations were incorporated into the program.

Monitoring

Nonpoint source pollution problems in the waters of the Commonwealth originate from land-based activities. The direct interrelationship between land activities and water quality necessitates that both the terrestrial and the aquatic environments are monitored and evaluated. To this end, the NPS Pollution Control Program has formed two on-site planning field teams. Each team consists of a DOW field team leader with an aquatic ecology background and a DOC field team member with an agronomy/agriculture background.

The actual collection, assessment, evaluation, and interpretation of both water quality and land-based data is the responsibility of the field teams. Physical characteristics of the waterbody, water chemistry, aquatic biological community structure, and land-based activities are different aspects of the waterbody's ecosystem that may be monitored. A multifaceted approach is necessary for NPS monitoring because of: (1) the mobility of NPS pollutants, (2) the varying degrees of pollutant toxicity, (3) the close interrelationship of land-based activities and NPS pollution, and (4) the spatial and temporal variabilities which exist in natural, dynamic ecosystems. Standard operating procedures (SOPs) specific for NPS monitoring activities are being developed for quality assurance and quality control. Nonpoint source SOPs will provide instruction and guidance in, and will ensure standardization of, study plan development, station location selection, water quality monitoring, land use/treatment monitoring, and weather monitoring. Additionally, field data sheets are being developed for improved reporting capabilities.

Water quality monitoring is an important aspect of the NPS program, especially: (1) where monitored water quality data is lacking, (2) where existing NPS pollution problems need to be quantified, and (3) where documentation is needed to show changes in water quality where alterations in land use practices have occurred. Monitoring will be conducted in priority watersheds and at demonstration projects.

Priority Watershed Monitoring Projects

Priority watersheds will be identified according to the prioritization process described in the Kentucky Nonpoint Source Management Program. The NPS field teams will conduct limited water quality monitoring in these priority watersheds, including but not limited to physicochemical and biological data. Some purposes for monitoring these watersheds are: (1) to identify or verify any nonpoint source pollution problem, (2) to determine if a waterbody is not supporting its designated uses as a result of NPS contamination, (3) to update the NPS Assessment Report, (4) to measure any changes in water quality, (5) to target areas for demonstration project implementation, and (6) to evaluate the prioritization process.

Demonstration Project: Turnhole Spring Groundwater Basin

Increasing public awareness of water quality problems at Mammoth Cave National Park has resulted in the development of the Mammoth Cave Karst Area Water Quality Oversight Committee. Its purpose is to achieve coordination among citizens, land users, and government agencies to monitor and improve the quality of waters in the karst area in south-central Kentucky.

A multi-agency technical committee consisting of representatives from local and state SCS offices, the ASCS, U.S. National Park Service, DOC, DOW, Kentucky Geological Survey, U.S. Geological Survey, Tennessee Valley Authority, University of Kentucky-College of Agriculture, Western Kentucky University-Department of Agriculture, and Western Kentucky University-Center for Cave and Karst Studies was established to work with the Mammoth Cave Karst Area Water Quality Oversight Committee in developing a nonpoint source water quality project for the Mammoth Cave area.

Turnhole Spring basin was targeted as the critical monitoring area within the Mammoth Cave drainage. Local SCS and ASCS representatives prioritized farms within Turnhole Spring basin for possible demonstration projects. Based on land resource needs, accessible water monitoring areas, and farmer cooperation, three farms were prioritized as demonstration farms. On each demonstration farm, best management practices will be implemented in a holistic, systems approach. Multi-agency monitoring efforts will be utilized to document agricultural impacts on the quality of surface waters, groundwaters, and wetlands, as well as to address cross-media interactions. DOW will be responsible for developing study plans for monitoring activities on demonstration farms; coordinating monitoring activities with other involved agencies; implementing water quality monitoring; and interpreting and documenting changes in water quality that relate to the implementation of BMPs. These demonstration farms will be used for agricultural education purposes.

Other Water Quality Projects

The NPS on-site planning field teams are also involved in other water quality projects. The team leaders provide technical assistance and limited monitoring for these projects, which are discussed below.

Upper Salt River/Taylorsville Reservoir Watershed

Fishery problems in Taylorsville Reservoir, including fish kills and reduced fish reproduction, have prompted multi-agency concern over the water quality in the Upper Salt River watershed. The U.S. Army Corps of Engineers, Kentucky Department of Fish and Wildlife Resources, and DOW have begun efforts to assess the fishery problems in the reservoir. The basin is being impacted from excessive nutrient and sediment loading from agricultural activities, municipal wastes, faulty septic systems, and other land use activities. A comprehensive study plan has been developed by NPS field team leaders, which describes the objectives and activities of agencies involved in water quality monitoring in the upper Salt River/Taylorsville Reservoir watershed. The NPS program proposed a study to determine the contribution of nonpoint source pollution from agricultural activities on the water quality of the upper Salt River. The NPS field teams have obtained and compiled various land use/cover/treatment data including, but not limited to, geology, pesticide usage, number of failing septic systems, number of dairies, and animal waste facilities in the watershed. In order to verify and update available land use/land cover data and to assist in selecting sampling stations, field reconnaissance of the watershed has been conducted by field team members and other DOW biologists. DOW biologists collected physicochemical and biological data as part of an intensive survey in the upper Salt River watershed. As part of the proposed study, stream flow was measured and water chemistry was sampled during three rain-events and one low flow period on the Salt River immediately upstream from Taylorsville Reservior. Sampling at eight additional locations is proposed for early 1990.

Upper Green River Watershed

The Concerned Citizens of Upper Green River for Better Water Quality has raised the public consciousness of water quality issues in the upper Green River watershed. In association with the SCS, this concerned citizen's group applied for, and received, a federal grant from the ASCS for implementing agricultural best management practices at a 75/25 percent cost share. The NPS teams have conducted county-level field reconnaissance with each SCS district conservationist to try to identify possible BMP installation sites and water quality sampling stations. Field reconnaissance was also conducted by NPS field teams in order to verify and update available land use/land cover data, and to assist in selecting sampling stations. The teams obtained and compiled various land use/cover/treatment data including, but not limited to, geology, pesticide usage, number of failing septic systems, number of dairies, and animal waste facilities in the watershed. Pre- and post-BMP monitoring, using a paired-watershed approach, will be conducted in order to document long-term effects of agriculture BMPs (especially nutrient management BMPs) on water quality. Pre-BMP low and normal flow condition water samples have been collected at each station. Additionally, pre-BMP biological data (fish, macroinvertebrates and algae) have been collected at each station. Additional pre-BMP data may be collected early in 1990.

Kentucky State University Farm Demonstration Project

The Kentucky State University (KSU) farm will soon be conducting a project to demonstrate and quantify the merits of soil and water conservation by integrating principles of sustainable agriculture into a whole-farm plan for limited-resource farmers. The demonstration program will integrate many principles of sustainable agriculture and soil and water conservation including reduced tillage, intensive grazing management, integrated pest management, and alternative crops. KSU requested technical assistance from the DOW concerning water quality monitoring, which was provided in early 1990. The initiation and maintenance of these systems will be videotaped to establish a library of instructional materials for farmers, small farm assistants, extension service personnel, and other interested people. This information will be available through the KSU on-farm media center and traditional channels. Farm tours and field days will also be planned.

Data Collection/Data Management

A necessary and important function of the NPS program is the collection and management of NPS-related information. The cooperative, multi-agency nature of the program prescribes the reliance upon, and utilization of, existing data such as land use classification statistics, baseline water quality values or best management practice evaluations. To this end a NPS document library has been developed. All NPS-related documents are cataloged, and pertinent data is entered on computer for future retrieval. In addition, a computer literature search service has been identified and utilized for accessing other scientific and technical information pertinent to the program. Further, several statewide databases have been identified and utilized, including county-specific fertilizer and pesticide databases.

Education

To a large extent, the implementation of BMPs to control NPS pollution in Kentucky relies upon voluntary adoption by those who manage the use of Kentucky's land resources. Therefore, education plays a vital role in Kentucky's NPS Management Program. NPS education programs inform land users and other Kentucky citizens about the causes, consequences, and solutions (BMP use) for the various types and sources of NPS pollution.

The DOW NPS program coordinates and supports a wide spectrum of NPS educational activities and programs. These programs are conducted by a number of cooperating agencies and institutions including the DOW, DOC, Division of Forestry, Division of Pesticides, local Conservation Districts, SCS, and the Kentucky Cooperative Extension Service. The DOW has provided program speakers for school classrooms, civic groups, trade organizations, and agency meetings. Additionally, exhibits and other educational materials have been provided for use in conferences, fairs, field days, and clean-up days.

The WATER WATCH program (described in another section of this report) has proven to be a particularly valuable channel for educating citizens about NPS water quality problems and solutions. The NPS program staff and the Water Watch coordinator are working to further expand WATER WATCH educational materials and programs to: (1) include more information on BMPs and NPS pollution control, (2) train participants to identify land use activities that are contributing to NPS pollution of their adopted waterbody, and (3) collect data about water quality, aquatic life, and aquatic habitat conditions.

Update of the Nonpoint Source Pollution Assessment Report

Section 319 of the Water Quality Act of 1987 required all states to complete and submit a statewide Nonpoint Source (NPS) Pollution Assessment Report to EPA. The NPS Assessment Report was an attempt to identify all waters contaminated by NPS pollution and the NPS categories contributing to the problem. Kentucky's report was completed and approved by EPA in January, 1989. EPA requires each state to update the report every year. An updated 1989 NPS Assessment Report can be obtained by contacting the DOW. Additionally, an update of the NPS Assessment Report is a part of the 305(b) reporting process. The assessment update will: (1) identify navigable waters impacted by NPS pollution, (2) detail changes that have occurred since the publication of the assessment in the 1988 305(b) Report, and (3) discuss NPS pollution in Kentucky's waters.

The NPS Pollution Assessment Report fulfills four requirements of Section 319 which are briefly summarized as follows:

1. Identify navigable waters which can not attain or maintain applicable water quality standards or goals and requirements of the Water Quality Act of 1987, without additional action to control NPS pollution.

2. Identify categories and subcategories of NPS pollution that affect waters identified in item 1.

3. Describe the process for identifying Best Management Practices (BMPs) and other measures to control NPS and to reduce such pollution to the "maximum extent practicable".

4. Identify and describe state and local programs for NPS control.

The discussion that follows relates to items 1. and 2. An example of the format used in Appendix D to identify NPS impacted waters is presented in Figure 1. Information contained in the appendix includes the waterbody code, waterbody name, NPS categories, parameters of concern, data sources, method of assessment, and designated uses not fully supported.

Figure 1. Data Table Organization for Nonpoint Source Impacted Waters

HYDROLOGIC CODE	STREAM NAME	N.P.S. CATEGORIES 1 2 3 4 5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
05100202-011	ROCKHOUSE CREEK	32 88 21 55 51	SED, MET, SO4, Cl	NPS SURVEY, 1987; 305(b), 1988	MONITORED	WAH

Waterbody Name and Code

The identification of waters impacted by NPS pollution consists of the name of the principal stream, lake, wetland, or groundwater site. The code further delineates the water being assessed and has been indexed in a computer storage and retrieval system for easy access to information compiled for the waterbody.

NPS Category

The categories and subcategories of NPS pollution sources for each of the listed waters and their codes were established in EPA's guidance document for the preparation of the 1990 305(b) report. Refer to Appendix D for a listing of the codes and sources.

Additionally, the NPS categories were prioritized based on the severity of the NPS impact. Prioritized categories appear in numbered columns, indicating the relative severity of NPS impacts for a specific waterbody. Column one identifies the NPS impact of greatest concern.

Parameters of Concern

This information indicates the parameters which significantly contribute to the NPS impacts. These parameters include sediment, nutrients, bacteria, chemicals, pesticides, metals, etc. See Appendix D for a list of the parameters and their abbreviations.

Data Sources: Evaluated/Monitored

Information for Kentucky's NPS Assessment Report was gathered from many different sources. Both evaluated and monitored data were obtained and used to assess the NPS impacts to streams and lakes, wetlands, and groundwaters. Two levels of assessment were used to determine the impact of NPS pollution: monitored or evaluated. "Monitored" waters are those that have been assessed based on current site-specific water quality data. Waters were labeled as being "evaluated" if they were judged to be impacted by NPS pollution based on field observations, citizen complaints, fish kill reports, land use data, etc. Additionally, specific water quality data more than five years old were labeled as evaluated.

Seventeen different information sources were used to evaluate actual and potential NPS impacts to the streams and lakes of Kentucky. Most of the evaluated impacts were based on data obtained from a 1987 NPS survey. The survey requested the conservation district boards in each county to identify surface waters affected by NPS pollution, categories or subcategories of NPS pollution, land uses, and conservation practices. The survey provided information based on the conservation districts' best professional judgment and the technical expertise of field representatives from the SCS and the DOC. The survey had a 100 percent response. Information was also obtained from a NPS survey of private citizens and groups with a known interest in water quality. There were 85 responses including those from various groups and organizations such as County Health Departments, the ASCS, and representatives from the Kentucky Chapters of the National Audubon Society and the Sierra Club. Evaluated information was not based on data gathered through actual monitoring efforts. The information was considered valuable, however, because of the proximity of those providing the data to the actual NPS problems.

Monitored water quality data were also used for assessing NPS impacts to Kentucky's streams and lakes. The 1986 and 1988 305(b) reports are data sources frequently identified in the assessment tables providing monitored physicochemical and bacteriological data. Other sources of data for the assessment include DOW ambient water quality data (DOW-AMB), DOW intensive surveys (DOW-IS), Water Resources Data for Kentucky (USGS, 1980), Environmental Impact Statement, Yatesville Lake Project (ACOE, 1985), The Effects of Coal Mining Activities on the Water Quality of

Streams in Western and Eastern Coalfields of Kentucky (DOW, 1981), water quality data from the Ohio River Valley Sanitation Commission (ORSANCO, 1988-1989), water quality data from the University of Kentucky (UK, 1989), DOW biomonitoring water quality data (DOW-BM), DOW lake monitoring program (DOW-LAKES, 1988-89), DOW bacteriological studies (DOW-BACT), DOW fixed biological stations (DOW-BIO), other DOW water quality data (DOW and TN Tech, 1989) and additional monitored water quality data from the EPA.

The extent of NPS contamination of groundwaters has not been thoroughly researched or documented. Approximately 30 different information sources were used to assess groundwater impacts. Literature searches revealed several site-specific groundwater studies which provided both evaluated and monitored information. Much of the specific monitored groundwater data was more than five years old, and therefore was identified as evaluated in the Data Sources column. DOW's groundwater staff provided most of the evaluated data.

Twelve different information sources were used to assess NPS impacts on wetlands. The majority of these sources provided actual monitored data. Physicochemical data were collected and documented by several information sources noted as Bosserman (1985); Mitsch (1985, 1983, 1982); and the Kentucky State Nature Preserves Commission (NPC) (1982, 1981, 1980a, 1980b, 1979). Biological data were also collected by NPC personnel for several of the wetland systems. The biological monitoring included qualitative and quantitative analyses of algae, macroinvertebrates, and fish. The data were collected more than 5 years ago so it was identified as evaluated in the assessment tables. Other evaluated wetland information was provided by the Draft Environmental Impact Statement, Reelfoot Lake Water Level Management (USFW, 1988); 1987 Nonpoint Source Survey (NPS Survey, 1987); and the Division of Water (DOW, 1989).

Uses Not Fully Supported

Kentucky water quality regulations classify streams based on identifiable uses. The stream use classifications are: (1) Warmwater Aquatic Habitat (WAH), (2) Coldwater Aquatic Habitat (CAH), (3) Domestic Water Supply (DWS) (4) Primary Contact Recreation (PCR), (5) Secondary Contact Recreation (SCR), and (6) Outstanding Resource Waters (ORW). Uses in several waterbodies have been designated as threatened due to land-based activities in the area. Threatened use means that while a use or uses are fully supported in these waterbodies, NPS pollution arising from current land use activities in those watersheds could potentially make these waterbodies not support a use. The use classifications help protect public health and welfare, and protect and enhance the quality of water for aquatic life. Partial and nonsupport are not differentiated in the tables, but these support categories are reported separately in the streams and rivers, and lake assessment chapters in this report.

Surface and Groundwaters Impacted by Nonpoint Source Pollution

Rivers, Streams and Lakes

Nonpoint source pollution of Kentucky's rivers, streams, and lakes is widespread, occurring in virtually every county of the state. Agricultural activities are the major sources of NPS pollution in Kentucky, both in terms of statewide distribution and the severity of pollution within a given area or watershed. Sedimentation due to water erosion of disturbed land is the primary consequence of agricultural land use.

Sediment is the most common nonpoint source pollutant by volume in Kentucky. It can cause navigational and flooding problems, threaten aquatic life, and transport large amounts of other pollutant materials. For example, nutrients and pesticides, two additional major categories of agricultural NPS pollutants, bind to, and are transported along with, sediment particles to streams and lakes.

Crop production is the primary agricultural land use activity affecting water quality. Because of its widespread occurrence, pastureland, especially where poorly maintained, is the second most common source of agricultural NPS pollution. Nutrient loading and bacterial contamination from feedlots, animal holding, and other livestock management areas are commonly occurring and often critical NPS problems throughout the Commonwealth. Other sources of agricultural NPS pollution include streambank erosion from unrestrained livestock, irrigated crop production, and speciality crop production (truck farming).

Surface coal mining activities are the most extensive and critical sources of NPS pollution that impact the streams and lakes of the Eastern and Western Kentucky Coalfields. Underground coal mine activities are a common secondary source of NPS pollution in these regions. Other mining-related nonpoint pollution sources in the state include runoff from limestone quarries and abandoned fluorspar mines.

Sediment, acid mine drainage, and elevated iron and sulfate concentrations are the principal pollutants associated with surface and underground coal mining activities. Sedimentation arises from stripping operations, haul roads, spoil banks on unreclaimed abandoned mine areas, deforested areas, sediment retention structures which have failed or do not operate properly, and sometimes surface disturbances associated with areas permitted for deep mining. Abandoned mines, which include underground mines and surface mines abandoned illegally or before mining regulations took effect, generally contribute the most severe acid water problems. Impacts from limestone quarries generally involve slight downstream increases in siltation and alkalinity.

Petroleum extraction activities occur in several regions of the Commonwealth. Improper brine discharges from oil and gas drilling operations result in high chloride levels, which in some areas are severe enough to eliminate aquatic fauna and adversely affect downstream public water supplies. Sedimentation from improperly constructed and maintained oil and gas facility service roads is also of concern.

Sedimentation of streams and lakes frequently results from silvicultural activities, or activities related to use of forest lands. Erosion can result from logging operations, saw mill runoff, reforestation, residue management, forest fires, haul road construction and maintenance, and woodland grazing of livestock. NPS pollution from silvicultural operations is widespread in Kentucky and is of special concern in steeply sloping areas.

Sediment is the major pollutant arising from several other source categories of NPS pollution. Construction activities (residential, commercial, or highway) can expose bare soil, resulting in severe erosion and sedimentation. Hydrologic habitat modification activities such as dredging, channelization, and flow regulation/modification, can alter the stream flow, disturb adjacent land area, and cause streambank erosion. Streambank erosion can also be caused by unrestrained access for livestock and increased runoff from impervious surfaces in urban areas.

Nonpoint source pollutants other than sediment are carried by runoff from several different categories of sources into Kentucky's streams and lakes. Stormwater runoff from urban areas washes nutrients, pesticides, bacteria, petroleum products, and a broad spectrum of other toxic substances into streams and lakes. On-site wastewater system runoff, especially from malfunctioning septic tanks, carries bacteria and nutrients to waterbodies. Solid waste and sewage is another frequently occurring NPS pollution category. While garbage, refuse, and debris primarily clog watercourses and create aesthetic eyesores, they can also be a water quality problem because of pollutant residues remaining in the discarded containers and packaging. Finally, herbicides and other toxic substances which are used in highway and railroad right-of-way maintenance, discarded in landfills, or used in industrial land treatment, have been reported to pollute Kentucky's streams and lakes.

Appendix D presents an updated, comprehensive listing of Kentucky rivers, streams, and lakes impacted by NPS pollution. Both monitored and evaluated data were used to update the 1989 version of the Kentucky Nonpoint Source Pollution Assessment Report. In many cases, analysis of the updated information has resulted in changes to designated use support determinations. Compared to earlier determinations, a greater number of rivers, streams, and lakes are now reported to not fully support their designated uses because of nonpoint sources of pollution. This is because additional available data have enabled use support determinations to be made for more of the Commonwealth's waters.

The appendix consists of tables organized by the eight major Kentucky river basins and minor tributaries of the Ohio River. Impacted waters are identified by Waterbody System number. When comparing this updated report to earlier versions of the Kentucky Nonpoint Source Pollution Assessment Report, it is important to note that the earlier reports identified impacted waters by P.L.-566 watershed number, and that there is not a one-to-one correspondence between the Waterbody and P.L.-566 cataloging systems.

Wetlands

Kentucky possesses a diversity and abundance of wetland resources. The major wetlands are identified as riverine, palustrine, and lacustrine. Human activities which adversely impact wetlands include resource exploration and extraction, agriculture, hydrologic/habitat modification, silviculture, and construction. Resource extraction activities of some type probably affect more acres of wetlands in Kentucky than any other category. Nonpoint source pollutants such as acid mine drainage and sedimentation have adversely impacted the water quality, soil saturation time, and vegetation of these wetlands. Another resource extraction activity, petroleum exploration and extraction, also has a detrimental effect on wetlands. Oil well drilling often results in modifications to the existing drainage patterns, with subsequent changes in adjacent wetland ecosystems. Additionally, oil spillage and brine discharges from active oil wells adversely impact wetlands.

Historically, the conversion of wetlands for agriculture has resulted in substantial losses of wetland resources in the Commonwealth. In addition to direct wetland loss through conversion, agricultural nonpoint source runoff containing high concentrations of sediments, nutrients, and pesticides can potentially degrade wetland areas.

Riparian wetlands are impacted by hydrologic/habitat modifications such as channelization and flood control activities. Straightening channels for flood control can prevent the natural flooding of wetlands and subsequently reduce their mineral and organic nourishment. Constructed levees can cut off wetlands from floodplains or increase water levels, both of which alter the natural soil saturation period and can cause an adverse change in wetland functions.

Another threat to wetland resources is silvicultural activities. Timber harvesting is periodically desired on wetland areas with large stands of timber. However, logging operations typically result in soil compaction and sedimentation, resulting in wetland alteration and degradation.

Wetlands in Kentucky are also affected by construction activities. Land development, highway construction, and other construction related activities can result in both wetland conversion and nonpoint source pollutant loading to adjacent wetlands.

Groundwater

One of the most valuable resources in Kentucky is the state's extensive groundwater system. Groundwater is susceptible to nonpoint source (NPS) contamination. Karst regions, which comprise about 50 percent of the Commonwealth, are especially vulnerable. Approximately 48 of Kentucky's 120 counties are considered at high to moderate risk for groundwater contamination. The variety of geologic settings within Kentucky provide for significant local differences in the transport, accumulation, and breakdown of pollutants in the subsurface environment. The spatial variability of land uses also affects the distribution of pollutants in groundwater. Activities that can lead to groundwater contamination include agriculture, on-site sewage systems, waste disposal, resource exploration, development and/or extraction, improper well construction and operation, urban development, construction, underground injection of liquids, underground storage tank leakage, and spills.

Agricultural activities have a major impact on Kentucky's groundwater resources. Sedimentation is a common contaminant resulting from agricultural activities, especially in karst areas where sediment-laden streams sink into subterranean caverns. Other identified contaminants from agricultural activities are pesticides, nutrients, and bacteria. Some types of pesticides are soluble in water and are transported to aquifers by percolation of precipitation or by runoff from cropland. Excessive amounts of nitrates, nitrites, and bacteria can potentially render an aquifer useless. These contaminants may reach groundwater sources via percolation of precipitation through contaminated soil or runoff from animal feedlots, animal waste storage facilities, animal waste spreading operations, and sewage disposal systems.

Another major NPS impact to Kentucky's groundwater is improperly constructed or maintained onsite sewage disposal systems. Bacteria, nutrients, and potentially hazardous chemicals are the major parameters of concern. Leakage from these systems percolates through the soil into groundwater sources. Contamination of well water by onsite sewage systems can pose serious health problems to well users.

Contaminants such as PCBs, metals, bacteria, and hazardous chemicals are major parameters of concern in leachate and runoff from inadequately constructed or maintained solid or hazardous waste disposal facilities. In karst areas, the relatively rapid rate of contaminant transport through the soil into the aquifer results in the decreased ability of the soil to filter contaminants from the water. Where a leak occurs in a facility's liner, contamination could be swift and extensive. Runoff from such areas can potentially cause serious degradation problems in groundwater systems. Illegal dumping of wastes into sinkholes, along roadsides, or in secluded areas may also impact groundwater resources.

Resource exploration, development and/or extraction activities can cause regional NPS groundwater contamination problems. Petroleum extraction activities, such as the construction and operation of oil and gas wells, can cause groundwater contamination. Elevated concentrations of chlorides and total dissolved solids in groundwater are associated with brine contamination from oil and gas well drilling activities. Brine can enter the groundwater system directly during the well drilling process via improper underground reinjection, or as a result of waterflooding techniques commonly used for secondary petroleum recovery. Other parameters of concern from petroleum activities include metals and sulfates. Groundwater systems in Kentucky's coal regions are particularly vulnerable to NPS pollution impacts as well. The major parameters of concern regarding coal mining activities are elevated concentrations of metals and acid mine drainage. To a varying degree, groundwater quality near abandoned mines can be impacted by NPS contaminants. The Division of Abandoned Lands has had a significant number of requests from local governments for assistance in developing public water supplies where existing groundwater sources have been adversely impacted.

Urban areas and construction activities have been identified as sources of NPS contaminants of groundwater. In urban karst areas, groundwater is vulnerable to contamination by metals, bacteria, pesticides, and oil and grease from street runoff. Highly contaminated stormwater runoff can directly recharge groundwater through sinkholes used as auxiliary stormwater disposal facilities and sinking streams. Sediment is usually the major contaminant from construction activities.

Underground injection of liquid wastes, underground storage tanks, and spills are other NPS polluters of groundwater. Underground injection of liquid wastes will severely impact an aquifer if the substance is injected directly into the aquifer. The parameters of concern are dependent upon the identity of the injected liquid. Leaking underground storage tanks can also cause localized groundwater damage. Petroleum products can readily percolate into underlying aquifers. Spills of toxic materials can reach groundwater systems by percolation or surface water recharge. Contamination from a spill can cause major degradation of a groundwater source.

Not only does nonpoint source pollution affect the quality of groundwater used for drinking, it also threatens aquatic organisms. Subterranean river basins and aquifers provide a unique habitat for certain endangered and rare species. Three rare animal species, Amblyopsis spelaea (Northern cavefish), Typhlichthys subterraneus (Southern cavefish), and Palaemonias ganteri (Kentucky cave shrimp) are known to inhabit subterranean waters in Kentucky. Survival of these species is directly related to suitable groundwater quality in the Mammoth Cave region. The only known population of Palaemonias ganteri is found in the Mammoth Cave region. It is listed as a federally endangered species by the U.S. Fish and Wildlife Service, because it "is in danger of extinction throughout all or a significant portion of its range."

Oil and gas drilling presently occurs in several groundwater basins that supply Mammoth Cave. Brine from such activities commonly reaches aquifers potentially creating physicochemical changes in groundwater quality. Finally, agricultural activities resulting in sedimentation, excessive nutrients, and the introduction of pesticides into the groundwater can potentially impact rare cave species.

Appendix D identifies groundwater basins that are known to be impacted by nonpoint source pollution. They were assessed using both evaluated and monitored data.

Evaluated data was based on non-monitored water quality information provided by DOW groundwater staff and the U.S. Geological Survey. More baseline data are needed to effectively evaluate the extent of contamination present in Kentucky's groundwater.

SURFACE WATER MONITORING PROGRAM

An effective water monitoring program is essential for making sound pollution control decisions and for tracking water quality improvements. Specifically, Kentucky's ambient monitoring program provides monitoring data to identify priority waterbodies upon which to concentrate agency activities, to revise state water quality standards, to aid in the development of wasteload allocations, and to determine water quality trends in Kentucky surface waters. As outlined in the Kentucky Ambient Surface Water Monitoring Strategy, the major objectives associated with the Ambient Monitoring Program are:

1. To operate a fixed-station monitoring network meeting chemical, physical, and biological data requirements of the state program and EPA's Basic Water Monitoring Program (BWMP).

2. To conduct intensive surveys on priority waterbodies in support of stream use designations, wasteload allocation model calibration/verification, and other agency needs.

3. To store data in EPA's STORET system, a computerized water quality data base.

4. To coordinate ambient monitoring activities with other agencies (EPA, Ohio River Valley Water Sanitation Commission, U.S. Geological Survey, U.S. Army Corps of Engineers, etc.).

Following is a discussion on components of the monitoring program (fixed-station monitoring, biological monitoring, intensive surveys). Elements of the toxicity testing program relating to surface waters, and a citizen education program called WATER WATCH, which includes a monitoring element, are also discussed.

Fixed-Station Monitoring Network

Fixed-station stream water quality monitoring sites active during 1988-1989 are listed in Table 37. Locations of these sites are depicted in Figure 2. Excluding the mainstem of the Ohio River, data generated by this monitoring network were used to characterize approximately 1,500 stream miles within the state.

For the reporting period (1988-1989), the Division of Water's physicochemical network consisted of 45 stream stations located in ten river basins. Water samples collected monthly at each station were analyzed for the parameters shown in Table 38. In addition, the Division supports and uses data collected by the Ohio River Valley Water Sanitation Commission (ORSANCO) at five major tributary stations. The Division also uses data from stations maintained as part of the U.S. Geological Survey's current monitoring programs.

Table 37

Fixed- Station Stream Monitoring Network

Map No.	Station Name	RMI*	Location
1	Tug Fork-Kermit	35.1	KY 40
2	Levisa Fork-Paintsville	69.4	US 23
3	Levisa Fork-Pikeville	117.3	KY 1426
4	Little Sandy River-Argillite	13.2	KY 1
5	Tygarts Creek-Load	28.1	KY 7
6	Licking River-Sherburne	126.7	KY 11
7	North Fork Licking River-Lewisburg	50.4	KY 419
8	South Fork Licking River-Cynthiana	49.1	KY 36/356
9	Licking River - Salyersville	266.9	KY 30
10	Eagle Creek-Glencoe	21.5	US 127
11	Kentucky River-Frankfort	66.4	St. Clair St. Bridge
12	South Elkhorn Creek-Midway	25.3	US 62/421
13	Dix River-Danville	34.6	KY 52
14	Kentucky River-Camp Nelson	135.1	Old US 27
15	Red River-Clay City	21.6	KY 15
16	Red River-Hazel Green	68.5	KY 746
17	Kentucky River-Heidelberg	249.0	KY 399
18	North Fork Kentucky River-Jackson	304.5	Old KY 30
19	Middle Fork Kentucky River-Tallega	8.3	KY 708
20	South Fork Kentucky River-Booneville	12.1	KY 28
21	Salt River-Shepherdsville	22.9	KY 61
22	Pond Creek-Louisville	15.4	Manslick Rd. Bridge
23	Rolling Fork-New Haven	38.8	US 31E
24	Beech Fork-Maud	48.1	KY 55
25	Green River-Munfordsville	225.9	Upstream US 31W
26	Nolin River-White Mills	80.9	White Mill Bridge
27	Bacon Creek-Priceville	7.3	C. Avery Rd. Bridge
28	Barren River-Bowling Green	37.5	College St. Bridge
29	Green River-Cromwell	130.6	Ohio Co. Water Dist. Intake
30	Mud River-Lewisburg	44.5	KY 106
31	Pond River-Apex	62.8	KY 189
32	Pond River-Sacramento	12.4	KY 85
33	Rough River-Dundee	62.5	Davidson Rd. Bridge
34	Tradewater River-Olney	72.6	KY 1220
35	Cumberland River-Pineville	654.4	Pine St. Bridge
36	Cumberland River-Cumberland Falls	562.3	KY 90
37	Rockcastle River-Billows	24.4	Old KY 80
38	Horse Lick Creek-Lamero	7.5	Daugherty Road
39	Buck Creek-Eubank	45.0	KY 70
40	Big South Fork Cumberland River-Yamacraw	40.3	KY 92
41	Cumberland River-Burkesville	427.0	Allen St. Boat Dock
42	Little River-Cadiz	24.4	KY 272
43	Clarks River-Almo	53.5	Almo-Shiloh Rd. Bridge
44	Mayfield Creek-Magee Springs	10.8	KY 121
45	Bayou de Chien-Clinton	15.1	US 51

*RMI = Location in River Mile Index file

Fixed - Station Monitoring Network

Stream Station Locations

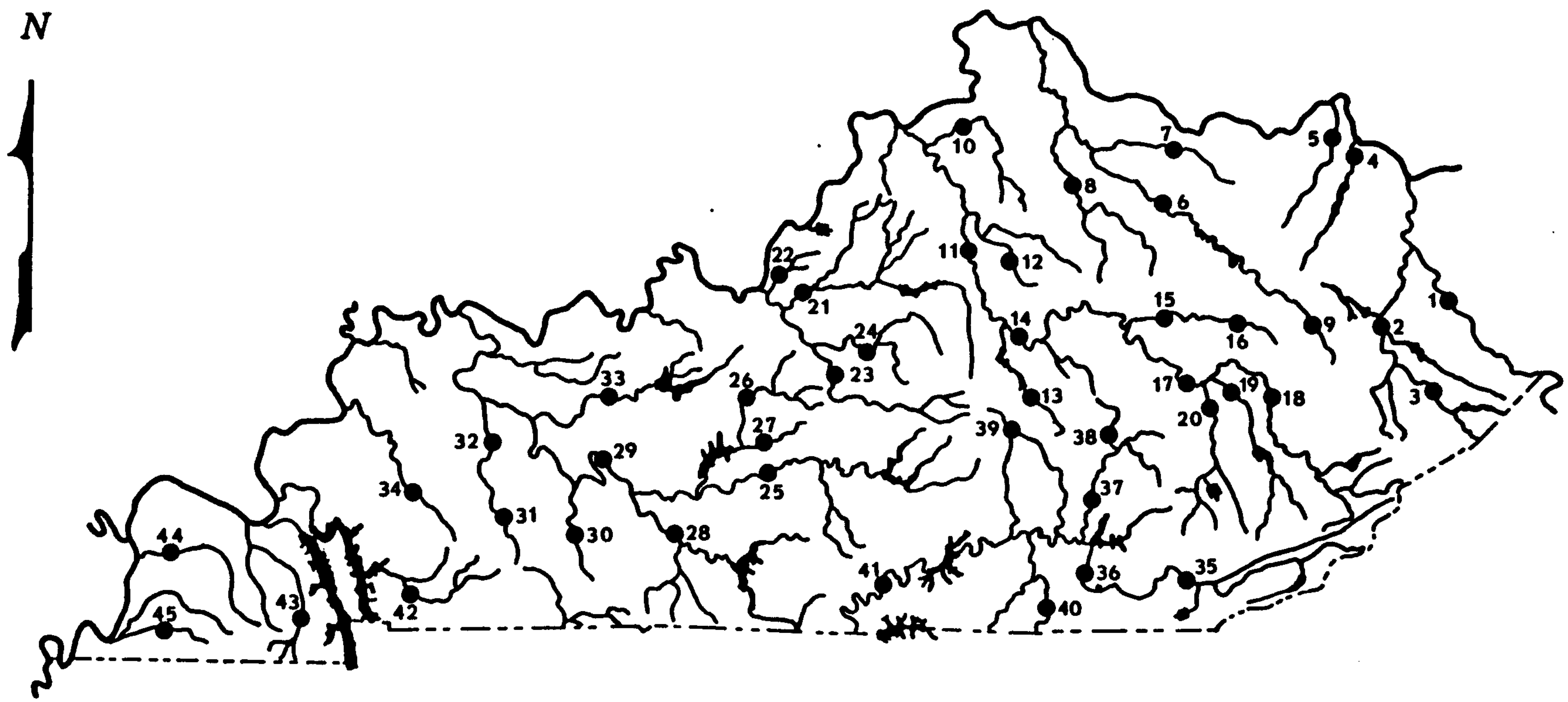

Figure 2

Table 38

Stream Fixed-Station Parameter Coverage
( ) STORET Parameter Code

Parameters	Parameters
Field Data	**Laboratory Data**
Weather code (47501)	Acidity, mg/l (00435)
Air temp, °C (00020)	Alkalinity, mg/l (00410)
Water temp, °C (00010)	BOD, 5-day, mg/l (00310)
Specific conductance uS/cm @ 25C (00094)	Chloride, mg/l (00940)
D.O., mg/l (00299)	Sulfate, dissolved mg/l (00946)
pH, S.U. (00400)	Suspended solids, mg/l (00530)
Turbidity, N.T.U. (82078)	TOC, mg/l (00680)
Flow, cfs (00060)	
Minerals, Total*	
Calcium, mg/l (00916)	
Magnesium, mg/l (00927)	**Metals, Total***
Potassium, mg/l (00937)	
Sodium, mg/l (00929)	Aluminum, ug/l (01105)
Hardness, mg/l (00900)	Arsenic, ug/l (01002)
	Barium, ug/l (01007)
Bacteria	Cadmium, ug/l (01027)
	Chromium, ug/l (01034)
Fecal coliform, colonies per 100 ml (31616)	Copper, ug/l (01042)
	Iron, ug/l (01045)
Nutrients	Lead, ug/l (01051)
	Manganese, ug/l (01055)
NH_3-N, mg/l (00610)	Mercury, ug/l (071900)
NO_2 + NO_3-N, mg/l (00630)	Zinc, ug/l (01092)
TKN, mg/l (00625)	
Total phosphorus, mg/l (00665)	

*Total as Total Recoverable

Lake monitoring was continued in 1988-1989 to address needs of two objectives. First, several lakes were sampled to evaluate problems of accelerated eutrophication. Second, three lakes were sampled to evaluate trends relating to potential acid precipitation impacts. Lakes in the ambient monitoring program are listed in Table 39, and the parameters measured are in Table 40. Embayments of Dale Hollow Lake were additionally monitored to determine if water quality was affected by tributary streams, which had elevated levels of chlorides and sulfates attributed to oil and gas production activities.

Table 39

Lake Ambient Monitoring Network

Lake	Station Location
Eutrophication Trend Lakes	
Reformatory	Dam
McNeely	Dam
Fish (1988 only)	Upper Lake Area
	Lower Lake Area
Barkley (1988 only)	Little River Embayment
Cumberland	Big Lily Creek Embayment
	Beaver Creek Embayment
Grayson	Dam*
	Upper Lake Area
Dewey	Dam*
Fishtrap	Dam*
	Upper Lake Area*
Nolin River (1988 only)	Dam
	Long Falls Creek Area
	Sportsman Paradise Area
	KY 88 Bridge Area
	Bacon Creek Area
Dale Hollow (1988 only)	Sulphur Creek Area
	Williams Creek Area
	Fanny's Branch Area
	Illwill Creek Area
	Little Sulphur Creek Area
	Spring Creek Area
Acid Precipitation Trend Lakes	
Tyner	Dam
Cannon Creek	Dam
Bert Combs	Dam

*Spring sampling to supplement Corps of Engineers sampling

Table 40

Lake Ambient Monitoring Parameters

Parameters	EUT[1]	ACP
Dissolved oxygen	X	
Temperature	X	
pH	X	X
Specific conductance	X	X
Depth of euphotic zone	X	
Acidity		X
Acid neutralizing capacity (Alkalinity)	X	X
T.[2] aluminum		X
Extractable aluminum		X
D.[3] Calcium		X
D. chloride		X
T. fluoride		X
D. fluoride		X
D. inorganic carbon		X
D. organic carbon		X
D. iron		X
D. magnesium		X
D. potassium		X
D. silica		X
D. sodium		X
D. sulfate		X
T. phosphorus	X	
T. soluble phosphorus	X	
Orthophosphate	X	
Ammonia-N	X	X
Nitrite & nitrate-N	X	
T. Kjeldahl-N	X	
Chlorophyll *a*	X	
Color		X

[1] EUT - lake eutrophication evaluation
ACP - lake acid precipitation evaluation

[2] Total

[3] Dissolved

Biological Monitoring

Kentucky's biological monitoring program currently consists of a network of 40 stations in 12 river basins. Data collected from these stations are used to ensure that existing water quality is maintained, provide background values against which future water quality conditions can be compared, and recognize emerging problems in the areas of toxic residue, bacteriological contamination and nuisance biological growth. Program emphasis is directed at evaluating warmwater aquatic habitat (WAH) use support, determining presence and concentration of toxic residues in fish tissue and sediments, and evaluating municipal and industrial effluents for toxic conditions. The information from these monitoring efforts supports EPA's Basic Water Monitoring Program, provides information to state programs, and is used in developing the 305(b) report. For this report, biological data from 40 sites sampled from 1986-1989 were used to assess 1124.6 miles of streams for WAH use. Biological monitoring station locations and parameter coverage are outlined in Table 41.

Intensive Surveys

Kentucky uses the intensive survey to evaluate site-specific water quality problems. Information developed from intensive surveys are essential in providing information to:

- Document the attainment/impairment of designated water uses,
- Verify and justify construction grants decisions,
- Address issues raised in petitions for water quality standards variances, or use redesignations,
- Document water quality improvements and progress resulting from water pollution control efforts.
- Establish base-line biological data required for permit requirements and establishment of standards.

In 1988-1989, nine intensive surveys were conducted on 763.1 miles of streams. The locations, purposes, and conclusions of these surveys are summarized in Table 42. During the 1990-1991 fiscal year, at least six intensive surveys are planned. Table 43 lists the locations and the objectives of each survey.

Table 41
Biological Monitoring Station Locations
and Sampling Coverage (1986-1989)

Station	U.S.G.S Hydrologic Unit No.	Algae	Macro-invertebrates	Fish	Fish Tissue	Sediments
Big Sandy River Basin						
Tug Fork	05070201	X	X			X
Levisa Fork (Paintsville)	05070203	X	X		X	X
Levisa Fork (Pikeville)	05070203	X	X		X	
Little Sandy River Basin						
Little Sandy River	05090104					X
Ohio River Tributaries						
Kinniconick Creek	05090201	X	X	X		X
Tygarts Creek	05090103	X	X	X	X	X
Licking River Basin						
North Fork Licking River	05100101	X	X			X
Licking River-Sherburne	05100101	X	X			X
Licking River-Salyersville	05100101	X	X	X	X	X
South Fork Licking River	05100102	X	X			X
Kentucky River Basin						
North Fork Kentucky River	05100201	X	X			X
Middle Fork Kentucky River	05100202	X	X			X
South Fork Kentucky River	05100203	X	X			X
Kentucky River, Lock 14	05100204	X	X			X
Red River (746 bridge)	05100204	X	X	X	X	X
Red River (Clay City)	05100204					X
Kentucky River, Camp Nelson	05100205	X	X		X	X
Kentucky R. below Frankfort	05100205	X	X		X	X
South Elkhorn Creek	05100205	X	X		X	X
Eagle Creek	05100205	X	X			X

Table 41 (Continued)

Station	U.S.G.S Hydrologic Unit No.	Algae	Macro-invertebrates	Fish	Fish Tissue	Sediments
Upper Cumberland River Basin						
Cumberland River	05130101	X	X			X
Rockcastle River	05130102	X	X	X	X	X
Horse Lick Creek	05130102	X	X			X
Green River Basin						
Nolin River	05110001	X	X	X	X	X
Bacon Creek	05110001	X	X	X		X
Green River (Munfordsville)	05110001	X	X			X
Green River (Morgantown)	05110003				X	
Barren River	05110002					X
Mud River	05110003	X	X		X	X
Rough River	05110004	X	X		X	X
Pond River	05110006	X	X	X	X	X
Salt River Basin						
Salt River (Shepherdsville)	05140102	X	X			X
Salt River (Glensboro)	05140102	X	X			X
Pond Creek	05140102	X	X			X
Beech Fork	05140103	X	X	X	X	X
Rolling Fork	05140103	X	X			X
Tradewater River Basin						
Tradewater River	05140205	X	X			X
Tennessee River Basin						
Clarks River	06040006	X	X		X	X
Mississippi River Basin						
Bayou de Chien	08010201	X	X			X
Mayfield Creek	08010201	X	X	X	X	X

X - indicates monitored parameters

Table 42
List of Intensive Surveys Conducted During FY 88 and 89

Hydrologic Unit Number/Stream	Purpose of Survey	Year Surveyed	Total Miles Assessed	Miles Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses	Conclusions
05070201 and 05070204	Determine recreational potential and identify reaches that violated Kentucky criteria for primary contact recreation.	1988	376.1	307.1		69.0	Water quality was acceptable for primary contact use in the Big Sandy, Tug Fork and Levisa Fork rivers. Elkhorn Creek and Russell Fork water quality was not acceptable.
05130205 Little River (Lower Cumberland River Basin)	Determine the impact of nonpoint source pollution from an intensely farmed watershed.	1988	132.2	0	132.2	0	The aquatic life of the Little River and its major tributaries has been impacted by nonpoint source agricultural pollution.
Donaldson Ck. (Lower Cumberland River Basin)	Served as a control stream in the Little River study.	1988	14.2	14.2	0	0	Donaldson Creek is a good quality stream system.
05130104 Rock Creek (Upper Cumberalnd River Basin)	Determine the effect of clear cutting activities in the headwaters and abandoned land acid mine pollution in the lower portion of the drainage.	1988	24.0	18.0	0	6.0	The upper 18 miles of Rock Creek support an exceptional diversity of aquatic life, while White Oak Creek and the lower four miles of Rock Creek are severely impacted by acid mine drainage from abandoned lands.

Table 42 (Continued)

Hydrologic Unit Number/Stream	Purpose of Survey	Year Surveyed	Total Miles Assessed	Miles Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses	Conclusions
05130101 Yellow Creek (Upper Cumberland River Basin).	Determine if the operation of the new Middlesboro wastewater treatment plant has improved the water quality of Yellow Creek.	1988	49	22.5	26.5	0	The aquatic community found in Yellow Creek below the Middlesboro Wastewater Treatment Plant has improved. Coal mining is still impacting the basin. Clear Fork is included in the assessment (8.1 mi) as evaluated.
05140102 Salt River Basin)	Determine the nonpoint source pollution impact to the upper Salt River basin (above Taylorsville Reservoir)	1989	130.7	130.7	0	0	The upper Salt River system has considerable agricultural activities taking place; however, the stream system is still able to support designated uses.
*05100205 Cedar Brook (Kentucky River Basin)	To determine if the water quality of the Cedar Brook system improved after the elimination of an industrial waste discharge.	1988	7	4.5	2.5	0	The stream has been and is continuing to recover after the elimination of the industrial waste discharge.
*Elk Lick Creek (Kentucky River Basin)	Determine the impact to a small stream system from a chlorinated discharge from a water supply treatment plant and nonpoint runoff from a gravel quarry operation.	1989	3.9	2.0	1.9	0	When the survey was initially conducted, 1.4 miles of the stream system was not supporting WAH use because of the chlorinated discharge. Gravel from the quarry embedded 1.5 miles of stream channel. After

Table 42 (Continued)

Hydrologic Unit Number/Stream	Purpose of Survey	Year Surveyed	Total Miles Assessed	Miles Supporting Uses	Miles Partially Supporting Uses	Miles Not Supporting Uses	Conclusions
							the chlorinated discharge was eliminated the stream was resurveyed and found to be recovering.
05100204 Millers Creek (Kentucky River Basin)	Determine if there has been improvement in water quality after the implementation of the state's chloride criteria to control brine pollution from petroleum activities	1989	26.0	0	0	26	Even though the water quality in this basin has improved, it has not improved enough to support a diverse community of aquatic life.

*Stream Not Shown on USGS Hydrologic Unit Map

Table 43
Proposed Intensive Surveys of the
Kentucky Division of Water for FY 90

Hydrologic Unit Number/ Stream	Objective	Type of Study
05100205 South Elkhorn Creek (Kentucky River Basin)	To assess water quality trends since upgrade of Lexington Main WWTP. Followup of 1981 DOW survey.	Full Intensive Survey
05100205 Eagle Creek (Kentucky River Basin)	To acquire baseline water quality and biological data prior to future industrial and urban development.	Full Intensive Survey
05090104 Little Sandy River (Little Sandy Basin)	To acquire baseline water quality and biological data prior to possible future industrial and urban development.	Full Intensive Survey
05100201 North Fork Kentucky River (Kentucky River Basin)	To follow up previous study of nonsupport of recreational uses (1988 305(b)) and possible issuance of advisories.	Bacteriological Survey
05100102 Stoner Creek (Licking River Basin)	Verify WLA model assumptions below Paris WWTP.	WLA Model Calibration/ Verification study.
05140101 Harrods Creek (Ohio River Basin)	Verify WLA model assumptions in lower Harrods Creek, which receives numerous discharges from municipal and package plant WWTP's.	WLA Model Calibration/ Verification study.

Toxicity Testing

The Commonwealth of Kentucky has enacted several regulations for the protection of aquatic life in receiving waters. These regulations, for the most part, are based on setting effluent limitations for individual chemicals. However, toxicity data are available for only a limited number of compounds. The use of single parameter protection criteria, therefore, does not provide adequate or correct protection of aquatic life in certain situations where: the toxicity of the components in the effluent or surface waters is not known; there are synergistic (greater than predicted), additive, or antagonistic (less than predicted) effects between toxic substances in the tested media; or a complete chemical characterization of the water has not been carried out. Since it is not economically feasible to determine the toxicity of each of the thousands of potentially toxic substances in surface waters or point-source effluents, the most direct and cost-effective approach is whole-effluent or surface water analysis of toxicity in a standard bioassay.

Assessment of the extent, presence, and control of toxic conditions in the waters of the Commonwealth has relied on chemical specific and whole-effluent monitoring for municipal and industrial discharges under the Kentucky Pollution Discharge Elimination System (KPDES) permit process, compliance biomonitoring on those point-source dischargers, and toxicity testing of sediments and surface waters associated with intensive surveys. Under the KPDES permitting program, most major industrial and municipal facilities, and a number of minor facilities discharging priority pollutants, will be required to conduct toxicity testing (acute or chronic) on their final effluent(s).

During 1988-89, acute and chronic toxicity tests were conducted by the Division of Water on 54 point source discharges and on instream locations above and below those sources. Stream miles acutely impacted by point and nonpoint source pollutants totalled 174.2 miles. Impacts assessed by river basin are listed in Table 44.

Table 44
Stream Miles Impacted By Toxic Discharges
Based on the Results of Toxicity Tests

Basin	Stream(s) Affected	Miles Impacted	Probable Cause(s)
Green River	Valley Creek	5.5	Chlorine
	Black Lick Creek	12.2	Cu, Hg, Zn
	Three Lick Fork	1.1	BOD, Ammonia, Cu
	Flat Creek	4.1	Chlorine,
	Taylor Fork	1.0	BOD, Zn
	Total	23.9	
Kentucky	Lane's Run	0.6	Ag
	Kentucky River	13.3	Nonpoint
	Town Creek	6.6	Chlorine, Zn, Nonpoint
	Total	20.5	
Licking River	Slate Creek	6.4	Nonpoint
	Total	6.4	
Cumberland River	Whitley Branch	1.0	Chlorine
	Big Lily Creek	2.9	Chlorine, BOD, Chloride, Cu
	Eddy Creek	1.9	Chlorine, Cu, Ni
	Total	5.8	
Tennessee River	Bee Creek	0.7	Chlorine, BOD, Zn
	Total	0.7	
Salt River	Spring Ditch	0.1	BOD
	Hammond Creek	5.6	Cu, Zn
	Rowan/Town Creeks	2.6	Nonpoint, Chlorine
	Mill Creek	13.3	Nonpoint
	Road Run Creek	3.5	Nonpoint
	Hardins Creek	6.6	Chlorine
	Clear Creek	8.9	Chlorine
	Salt River	14.2	Nonpoint
	Salt River	20.4	Nonpoint
	Salt River	11.8	Chlorine
	Chenoweth Run	2.5	Chlorine
	Total	89.5	

Table 44 (Continued)

Basin	Stream(s) Affected	Miles Impacted	Probable Cause(s)
Mississippi River	Harris Fork Creek	2.1	Chlorine, Cd, Zn
	Mayfield Creek	1.2	Nonpoint, BOD, Ammonia, Zn
	Total	3.3	
Ohio River	Thrasher Creek	2.6	BOD, Volatile Organics
	Gunpowder Creek	0.3	Chlorine, Mn
	Crooked Creek	17.5	BOD
	West Ditch	1.0	BOD, Cyanide, TSS, TDS, Al, Cu, Fe, Ni, Zn
	Ohio River	0.1	Nonpoint, BOD, Al, Fe, Zn
	Ohio River	0.1	Al, Fe, Zn
	Ohio River	0.5	Nonpoint, Al, Fe, Zn
	Hite Creek	2.0	BOD
	Total	24.1	
	State Total	174.2	

Citizens Water Watch Program

The Kentucky WATER WATCH program is administered by the Natural Resources and Environmental Protection Cabinet's Division of Water. Launched in 1985, WATER WATCH promotes individual responsibility for a common resource, educates Kentuckians about the wise use and protection of local water resources, provides a recreational opportunity through group activities, and gives citizens more access to their government. Objectives include: **promoting individual responsibility** for a common resource by fostering a public role in drawing attention to specific problem situations; **enhancing citizen understanding and support** through a strong program of public education; and **communicating the value of environmental quality** in attracting industry and tourism to the state. The Division of Water promotes the program by encouraging citizens to form groups which "adopt" waterbodies of local interest.

After a group is formed, members identify the stream, lake or wetland they want to adopt and submit an "adoption" form for approval to the Division of Water. After the adoption is approved, the WATER WATCH group then promotes community awareness and protection of their adopted water resource through stream monitoring, school based programs, and stream rehabilitation projects.

Each group receives training from the Division's program coordinator and educational resources. The latter include a WATER WATCH Program Manual and two field guides (A Field Guide to Kentucky's Lakes and Wetlands and A Field Guide to Kentucky's Rivers and Streams).

Since its beginning, over 270 groups have been established with more than 800 members statewide, and over 20,000 people have received an overview presentation telling them about the program. Two hundred and fifty streams, 25 lakes, 30 wetlands and nine karst or underground systems have been adopted. Over 100 basic training workshops have been held in conjunction with the program statewide. Advanced training workshops for volunteers are also offered from time to time.

Volunteer Stream Sampling Project

The WATER WATCH Program initiated a Volunteer Stream Sampling Project in 1987. The objectives were: (1) to assist local groups in developing information concerning the quality of water resources close to them, (2) to gather information about stream segments not covered by the existing Kentucky Ambient Water Quality Monitoring Network, and (3) to educate the public about the condition and importance of Kentucky's water resources.

To date, the project has recruited over 54 volunteer teams consisting of over 300 volunteers to conduct regular water quality tests on streams in their communities. Although the information obtained cannot be used in enforcement action, citizen monitoring can and has provided useful "flagging" of water quality problems. Remedial action has occurred as a result of these efforts.

The teams are equipped with commercial water testing kits for measuring dissolved oxygen, pH, temperature, nitrate-nitrogen, ortho-phosphate, sulfate, iron and chloride. Volunteers are trained in testing and reporting procedures, quality control, and how to interpret results. Training also involves discussing ways the information can be shared through various organizations and media outlets.

Recruited groups have agreed to perform monthly tests on at least two designated sites in their community for one year. The volunteers submit the results to the Division, usually within one week after the tests are performed. The results are tabulated, summarized, and reported back to the groups.

The project is producing site data from 89 stations on streams in seven of Kentucky's 12 major river basins. The program is administered on a continuing basis by the WATER WATCH Program Coordinator at the Division of Water as a part of the overall WATER WATCH Program. New sites are being added continuously. Local groups, civic organizations, schools, and businesses contribute to the project.

CHAPTER 5

RECOMMENDATIONS

LIST OF RECOMMENDATIONS

The actions listed below are recommended in order to achieve further progress in meeting the goals and objectives of the Clean Water Act.

- Emphasize the importance of biocriteria development for use support evaluations, by incorporating the aquatic ecoregion/reference stream site approaches, in state programs funded by Section 106 of the Clean Water Act.

- Increase the number of state waters studied for fish tissue contamination by toxic pollutants.

- Place emphasis on the following activities in the Construction Grants Program.

  (1) Pursue more efficient methods for administering the revolving fund program's procedures, reviews and requirements, with the intent of eliminating those found to be unnecessary.

  (2) Continue to implement an effective community outreach program by working with communities in the field through the planning, design and construction stage of projects.

  (3) Continue to pursue full state delegation of all construction - related activities, focusing on cost-saving measures such as adherence to construction schedules and change order management.

- Develop a national concept for groundwater protection that will be implemented through a regulatory approach, which includes minimum groundwater quality standards and mandatory requirements for state programs. The U.S. EPA should integrate this overall groundwater protection strategy into regulations promulgated under the authority of the Clean Water Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation and Liability Act, the Safe Drinking Water Act, and the Federal Insecticide, Fungicide and Rodenticide Act. The U.S. EPA should take the lead in developing a comprehensive framework for coordinating federal programs.

- Pursue a comprehensive state aquifer mapping and groundwater classification program. A program of this nature would fill in the existing gaps in the available data and provide a better means for groundwater protection. Currently, resource limitations prevent the state from implementing such a program.

- Adopt a minimum set of state groundwater data elements to be collected from regulated entities. This data set must include latitude and longitude coordinates. The data could then be used to produce maps using a Geographic Information System.

- Continue federal funding of the Clean Lakes Program. Kentucky has benefitted from the federal Clean Lakes Program through its funding of lake assessment projects and a Phrase I project on McNeely Lake.

- Continue federal funding of Section 319 of the 1987 Clean Water Act Amendments to support state nonpoint source control programs.

APPENDIX A

TREND ANALYSIS AND DATA SUMMARY TABLES

BIG SANDY RIVER BASIN

PARAMETER		TUG FORK AT KERMIT 1982-1988	LEVISA FORK AT PIKEVILLE 1982-1988	LEVISA FORK AT PAINTSVILLE 1982-1988	BIG SANDY RIVER AT LOUISA 1982-1989*
STREAM FLOW(CFS)	MEASUREMENTS	-	70	72	82
	MINIMUM	102	152	261	400
	MAXIMUM	82200	9750	18540	67600
	MEAN	1300	1140	1800	5295
	TREND	0	0	0	ND
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	71	69	70	83
	MINIMUM	4.9	4.9	4.4	3.0
	MAXIMUM	15.9	15.5	14.5	14.8
	MEAN	8.8	8.9	8.8	9.5
	TREND	0	0	0	ND
BOD (mg/L)	# OF SAMPLES	47	48	48	69
	MINIMUM	0.1	0.1	0.1	0.2
	MAXIMUM	2.6	2.8	1.9	8.9
	MEAN	0.7	0.7	0.7	1.7
	TREND	0	0	0	ND
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	79	79	79	82
	MINIMUM	66	67	75	48
	MAXIMUM	285	266	258	230
	MEAN	156	168	164	149
	TREND	0	Inc.	0	Inc.
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	76	77	78	83
	MINIMUM	142	180	99	130
	MAXIMUM	1134	690	686	810
	MEAN	511	419	403	423
	TREND	0	Inc.	0	ND
pH (UNITS)	# OF SAMPLES	73	72	76	82
	MINIMUM	5.5	6.1	6.1	6.7
	MAXIMUM	8.3	8.4	7.9	8.1
	MEAN	7.3	7.1	7.1	7.5
	TREND	0	0	0	ND
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	77	78	78	-
	MINIMUM	10	8	26	-
	MAXIMUM	219	125	106	-
	MEAN	114	66	68	-
	TREND	0	Inc.	0	-
CHLORIDE (MG/L)	# OF SAMPLES	78	79	79	42
	MINIMUM	2	4	4	1
	MAXIMUM	90	40	46	37
	MEAN	20	14	16	20
	TREND	0	Inc.	Inc.	ND

BIG SANDY RIVER BASIN (cont.)

PARAMETER		TUG FORK AT KERMIT 1982-1988	LEVISA FORK AT PIKEVILLE 1982-1988	LEVISA FORK AT PAINTSVILLE 1982-1988	BIG SANDY RIVER AT LOUISA 1982-1989*
	# OF SAMPLES	78	79	78	81
SULFATE	MINIMUM	57	13	60	24
(MG/L)	MAXIMUM	314	246	246	209
	MEAN	130	126	120	112
	TREND	Inc.	Inc.	Inc.	0
	# OF SAMPLES	77	79	79	80
SUSPENDED	MINIMUM	1	2	2	1
SOLIDS	MAXIMUM	942	705	792	742
(MG/L)	MEAN	61	50	66	64
	TREND	0	0	0	Dec.
	# OF SAMPLES	79	78	79	83
TOTAL	MINIMUM	0.01	0.01	0.01	0.02
PHOSPHOROUS	MAXIMUM	0.28	0.66	0.36	0.78
(mg/L)	MEAN	0.06	0.05	0.06	0.08
	TREND	Dec.	Dec.	Dec.	Dec.
	# OF SAMPLES	76	76	75	84
TOTAL	MINIMUM	5	2	1	2
ZINC	MAXIMUM	79	204	81	140
(ug/L)	MEAN	23	24	23	21
	TREND	0	0	0	Dec.
	# OF SAMPLES	78	78	78	84
TOTAL	MINIMUM	1	1	1	5
LEAD	MAXIMUM	41	62	96	140
(ug/L)	MEAN	5	5	7	16
	TREND	Dec.	0	0	Dec.
	# OF SAMPLES	77	79	79	81
NITRITE +	MINIMUM	0.06	0.03	0.06	0.04
NITRATE-	MAXIMUM	0.84	1.12	1.03	-
NITROGEN	MEAN	0.41	0.33	0.44	0.89
(mg/L as N)	TREND	0	0	0	0

* - ORSANCO Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

LITTLE SANDY RIVER AND TYGARTS CREEK

PARAMETER		LITTLE SANDY AT ARGILLITE 1985-1988	TYGARTS CREEK AT LOAD 1985-1988
	MEASUREMENTS	26	26
STREAM	MINIMUM	31	3
FLOW(CFS)	MAXIMUM	2561	940
	MEAN	492	268
	TREND	0	0
	# OF SAMPLES	38	38
DISSOLVED	MINIMUM	4.4	5.3
OXYGEN	MAXIMUM	15.7	15.2
(mg/L)	MEAN	9.9	9.7
	TREND	Inc.	0
	# OF SAMPLES	9	9
BOD	MINIMUM	0.2	0.6
(mg/L)	MAXIMUM	1.8	1.6
	MEAN	0.8	1.1
	TREND	0	0
	# OF SAMPLES	38	36
TOTAL	MINIMUM	45	73
HARDNESS	MAXIMUM	195	156
(mg/L AS	MEAN	87	104
CACO3)	TREND	0	0
	# OF SAMPLES	38	38
SPECIFIC	MINIMUM	121	142
CONDUCTANCE	MAXIMUM	310	386
(uS/CM)	MEAN	230	225
	TREND	Inc.	0
	# OF SAMPLES	36	36
pH	MINIMUM	6.2	6.3
(UNITS)	MAXIMUM	7.5	7.7
	MEAN	6.9	7.1
	TREND	Inc.	Inc.
	# OF SAMPLES	38	38
ALKALINITY	MINIMUM	16	46
(mg/L AS	MAXIMUM	198	159
CACO3)	MEAN	37	84
	TREND	0	0
	# OF SAMPLES	38	38
CHLORIDE	MINIMUM	1	2
(MG/L)	MAXIMUM	52	21
	MEAN	22	8
	TREND	0	Inc.

PARAMETER		LITTLE SANDY AT ARGILLITE 1985-1988	TYGARTS CREEK AT LOAD 1985-1988
	# OF SAMPLES	38	38
SULFATE	MINIMUM	27	9
(MG/L)	MAXIMUM	52	41
	MEAN	40	22
	TREND	0	0
	# OF SAMPLES	36	37
SUSPENDED	MINIMUM	3	1
SOLIDS	MAXIMUM	399	372
(MG/L)	MEAN	39	22
	TREND	Dec.	Dec.
	# OF SAMPLES	38	38
TOTAL	MINIMUM	0.01	0.01
PHOSPHOROUS	MAXIMUM	0.18	0.15
(mg/L)	MEAN	0.03	0.02
	TREND	Dec.	Dec.
	# OF SAMPLES	38	38
TOTAL	MINIMUM	6	2
ZINC	MAXIMUM	71	69
(ug/L)	MEAN	23	18
	TREND	Inc.	0
	# OF SAMPLES	38	38
TOTAL	MINIMUM	1	1
LEAD	MAXIMUM	6	32
(ug/L)	MEAN	2	3
	TREND	0	Inc.
	# OF SAMPLES	38	38
NITRITE +	MINIMUM	0.12	0.02
NITRATE-	MAXIMUM	0.57	1.36
NITROGEN	MEAN	0.36	0.46
(mg/L as N)	TREND	0	0

0 - No Trend
Inc. - Increasing
Dec. - Decreasing

LICKING RIVER BASIN

PARAMETER		LICKING RIVER AT SALYERSVILLE 1985-1988	LICKING RIVER AT SHERBURNE 1984-1988	N. FK. LICKING AT LEWISBURG 1982-1988	S. FK. LICKING AT CYNTHIANA 1994-1988	LICKING R. AT BUTLER 1982-1988**	LICKING R. AT COVINGTON 1982-1989*
STREAM FLOW(CFS)	MEASUREMENTS	25	45	78	45	23	81
	MINIMUM	2	69	0	2	54	100
	MAXIMUM	1350	9430	1650	2500	47100	31100
	MEAN	180	1864	171	396	4724	3514
	TREND	0	0	0	0	ND	ND
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	31	56	83	55	23	81
	MINIMUM	4.5	5.6	4.5	2.4	4.7	3.5
	MAXIMUM	12.4	14.2	15.2	15.8	13.4	14.6
	MEAN	8.5	9.7	10.1	10.5	9.3	8.9
	TREND	0	0	0	0	ND	ND
BOD (mg/L)	# OF SAMPLES	9	26	50	25	-	70
	MINIMUM	1.1	0.3	0.2	0.5	-	0.1
	MAXIMUM	2.5	3.1	6.1	8.1	-	4.2
	MEAN	1.4	0.9	1.5	2.7	-	1.4
	TREND	0	0	Inc.	0	-	ND
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	36	57	83	56	-	78
	MINIMUM	95	44	51	138	-	54
	MAXIMUM	590	214	314	412	-	280
	MEAN	258	87	167	194	-	133
	TREND	0	0	0	0	-	0
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	35	57	79	56	23	80
	MINIMUM	196	140	96	320	155	60
	MAXIMUM	2970	277	480	702	410	600
	MEAN	931	212	318	446	279	300
	TREND	0	0	0	Inc.	ND	ND

LICKING RIVER BASIN (cont.)

PARAMETER		LICKING RIVER AT SALYERSVILLE 1935-1988	LICKING RIVER AT SHERBURNE 1984-1988	N. FK. LICKING AT LEWISBURG 1982-1988	S. FK. LICKING AT CYNTHIANA 1984-1988	LICKING R. AT BUTLER 1982-1988**	LICKING R. AT COVINGTON 1982-1989*
pH (UNITS)	# OF SAMPLES	33	57	82	55	23	82
	MINIMUM	5.5	6.5	6.3	6.1	6.7	5.3
	MAXIMUM	8.1	9.6	8.7	9.1	8.4	9.1
	MEAN	6.9	7.5	7.4	7.8	7.7	7.5
	TREND	Inc.	0	0	0	ND	ND
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	35	55	82	55	15	-
	MINIMUM	22	25	40	19	51	-
	MAXIMUM	108	108	282	340	141	-
	MEAN	63	48	129	147	87	-
	TREND	0	0	0	Dec.	ND	-
CHLORIDE (MG/L)	# OF SAMPLES	34	55	82	55	23	38
	MINIMUM	29	2	1	4	3	4
	MAXIMUM	1010	33	21	103	23	87
	MEAN	235	14	9	26	13	19
	TREND	0	0	0	0	ND	ND
SULFATE (MG/L)	# OF SAMPLES	35	55	83	55	23	77
	MINIMUM	42	13	15	21	21	12
	MAXIMUM	163	38	65	58	48	127
	MEAN	93	27	33	34	34	35
	TREND	0	0	0	0	ND	Inc.
SUSPENDED SOLIDS (MG/L)	# OF SAMPLES	36	55	80	54	23	78
	MINIMUM	2	1	1	1	8	7
	MAXIMUM	338	644	1100	263	190	532
	MEAN	52	45	55	20	51	63
	TREND	0	0	0	0	ND	0

LICKING RIVER BASIN (cont.)

PARAMETER		LICKING RIVER AT SALYERSVILLE 1985-1988	LICKING RIVER AT SHERBURNE 1984-1988	N. FK. LICKING AT LEWISBURG 1982-1988	S. FK. LICKING AT CYNTHIANA 1984-1988	LICKING R. AT BUTLER 1932-1988**	LICKING R. AT COVINGTON 1982-1989*
	# OF SAMPLES	35	56	83	56	23	79
TOTAL	MINIMUM	0.02	0.01	0.01	0.04	0.03	0.02
PHOSPHOROUS	MAXIMUM	0.35	0.77	1.79	0.93	0.40	3.80
(mg/L)	MEAN	0.07	0.06	0.15	0.27	0.10	0.23
	TREND	0	0	0	0	ND	Dec.
	# OF SAMPLES	36	54	79	53	-	82
TOTAL	MINIMUM	1	1	1	1	-	2
ZINC	MAXIMUM	71	101	119	-	-	1000
(ug/L)	MEAN	24	22	21	-	-	41
	TREND	0	0	0	0	-	Dec.
	# OF SAMPLES	36	56	81	55	-	82
TOTAL	MINIMUM	1	1	1	1	-	10
LEAD	MAXIMUM	10	20	238	33	-	50
(ug/L)	MEAN	2	3	9	4	-	14
	TREND	Inc.	0	0	0	-	Dec.
	# OF SAMPLES	35	57	83	56	-	79
NITRITE +	MINIMUM	0.22	0.03	0.02	0.01	-	0.01
NITRATE-	MAXIMUM	1.35	1.81	4.64	5.51	-	2.96
NITROGEN	MEAN	0.54	0.55	1.24	1.82	-	0.79
(mg/L as N)	TREND	0	0	0	0	-	0

* - ORSANCO Station
** - USGS Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

PARAMETER		N. FK. KY. R. AT JACKSON 1984-1988	MIDDLE FK. KY. AT TALLEGA 1984-1988	S. FK. KY. R. AT BOONEVILLE 1984-1988	KY. R. AT HEIDELBERG 1982-1988	RED R. AT HAZEL GREEN 1982-1988
STREAM FLOW(CFS)	MEASUREMENTS	44	45	45	69	80
	MINIMUM	57	36	6	104	0
	MAXIMUM	6370	3910	7400	24800	1466
	MEAN	859	524	579	3530	117
	TREND	0	0	0	0	Inc.
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	55	54	54	80	83
	MINIMUM	5.6	5.4	4.8	5.9	5.4
	MAXIMUM	14.2	14.4	14.4	14.4	14.6
	MEAN	9.4	9.1	9.1	9.8	10.1
	TREND	0	0	0	0	0
BOD (mg/L)	# OF SAMPLES	24	24	24	51	50
	MINIMUM	0.1	0.1	0.1	0.1	0.1
	MAXIMUM	2.1	2.3	3.2	7.1	3.9
	MEAN	0.9	0.7	0.9	1.1	0.9
	TREND	0	0	0	0	0
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	57	57	57	83	82
	MINIMUM	122	47	51	69	14
	MAXIMUM	552	201	222	355	710
	MEAN	247	100	106	158	59
	TREND	0	0	0	Inc.	0
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	56	56	57	78	79
	MINIMUM	273	137	122	164	55
	MAXIMUM	809	365	740	1039	319
	MEAN	538	242	308	421	123
	TREND	Inc.	Inc.	0	Inc.	Inc.
pH (UNITS)	# OF SAMPLES	54	54	55	82	79
	MINIMUM	6.8	6.4	6.4	6.4	6.1
	MAXIMUM	8.5	8.4	8.3	8.7	8.2
	MEAN	7.6	7.3	7.3	7.4	7.1
	TREND	0	0	0	0	Inc.
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	56	56	56	82	81
	MINIMUM	35	15	15	20	3
	MAXIMUM	147	69	91	104	70
	MEAN	81	41	41	53	32
	TREND	Inc.	0	Inc.	0	0
CHLORIDE (MG/L)	# OF SAMPLES	56	56	55	82	79
	MINIMUM	2	1	3	4	1
	MAXIMUM	105	35	123	211	11
	MEAN	11	7	24	33	5
	TREND	Inc.	0	Inc.	Inc.	0

KENTUCKY RIVER BASIN (cont.)

PARAMETER		N. FK. KY. R. AT JACKSON 1984-1988	MIDDLE FK. KY. AT TALLEGA 1984-1988	S. FK. KY. R. AT BOONEVILLE 1984-1988	KY. R. AT HEIDELBERG 1982-1988	RED R. AT HAZEL GREEN 1982-1988
	# OF SAMPLES	57	56	57	83	83
SULFATE	MINIMUM	91	35	33	30	10
(MG/L)	MAXIMUM	470	90	131	294	199
	MEAN	171	60	69	95	19
	TREND	0	0	0	Inc.	Inc.
	# OF SAMPLES	55	55	54	81	78
SUSPENDED	MINIMUM	1	1	1	1	1
SOLIDS	MAXIMUM	461	182	144	540	591
(MG/L)	MEAN	48	22	15	40	41
	TREND	0	0	0	0	0
	# OF SAMPLES	55	57	56	83	83
TOTAL	MINIMUM	0.01	0.01	0.01	0.01	0.01
PHOSPHOROUS	MAXIMUM	0.21	0.12	0.11	0.36	0.39
(mg/L)	MEAN	0.04	0.02	0.02	0.03	0.04
	TREND	0	0	0	Dec.	0
	# OF SAMPLES	52	52	51	77	79
TOTAL	MINIMUM	1	1	1	1	1
ZINC	MAXIMUM	113	143	84	280	374
(ug/L)	MEAN	28	22	17	25	22
	TREND	0	0	Inc.	0	0
	# OF SAMPLES	56	56	55	82	82
TOTAL	MINIMUM	1	1	1	1	1
LEAD	MAXIMUM	72	48	18	30	112
(ug/L)	MEAN	5	3	3	6	5
	TREND	0	0	Dec.	Dec.	0
	# OF SAMPLES	56	56	55	83	83
NITRITE +	MINIMUM	0.04	0.02	0.02	0.01	0.01
NITRATE-	MAXIMUM	1.02	0.49	0.65	0.78	0.96
NITROGEN	MEAN	0.43	0.22	0.27	0.35	0.34
(mg/L as N)	TREND	Dec.	0	Dec.	0	0

0 - No Trend
Inc. - Increasing
Dec. - Decreasing

PARAMETER		KY. R. AT CAMP NELSON 1982-1988	KENTUCKY RIVER AT FRANKFORT 1982-1988	S. ELKHORN CK NEAR MIDWAY 1987-1988	KENTUCKY RIVER AT LOCKPORT* 1982-1988	EAGLE CREEK AT GLENCOE 1982-1988
STREAM FLOW(CFS)	MEASUREMENTS	48	48	12	55	34
	MINIMUM	142	155	15	356	0
	MAXIMUM	38750	43410	189	84400	10160
	MEAN	4546	5114	71	9070	725
	TREND	0	0	0	ND	Dec.
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	80	83	28	55	81
	MINIMUM	6.5	5.5	2.6	5.4	3.4
	MAXIMUM	15.1	14.4	13.9	13.4	17.9
	MEAN	10.2	9.9	7.6	9.1	10.4
	TREND	Dec.	0	Inc.	ND	0
BOD (mg/L)	# OF SAMPLES	51	50	23	-	51
	MINIMUM	0.1	0.1	0.3	-	0.1
	MAXIMUM	3.7	5.9	7.6	-	2.6
	MEAN	1.2	1.3	2.5	-	1.1
	TREND	0	0	0	-	0
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	82	83	30	10	82
	MINIMUM	65	82	62	100	72
	MAXIMUM	273	339	271	160	452
	MEAN	139	141	191	133	186
	TREND	0	0	0	ND	Dec.
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	81	83	29	56	82
	MINIMUM	130	140	279	145	206
	MAXIMUM	995	571	919	630	550
	MEAN	353	329	176	342	365
	TREND	0	0	Dec.	ND	0
pH (UNITS)	# OF SAMPLES	78	80	29	55	81
	MINIMUM	6.6	6.3	6.7	7.1	6.6
	MAXIMUM	8.8	8.6	8.7	8.6	8.2
	MEAN	7.6	7.6	7.4	7.8	7.5
	TREND	0	0	0	ND	Inc.
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	79	80	32	34	82
	MINIMUM	8	37	35	1	27
	MAXIMUM	108	172	194	136	367
	MEAN	66	78	128	92	143
	TREND	0	0	Dec.	ND	Dec.
CHLORIDE (MG/L)	# OF SAMPLES	81	82	30	54	81
	MINIMUM	1	6	6	3	1
	MAXIMUM	175	72	485	65	63
	MEAN	28	20	66	19	9
	TREND	0	0	0	ND	Inc.

KENTUCKY RIVER BASIN (cont.)

PARAMETER		KY. R. AT CAMP NELSON 1982-1988	KENTUCKY RIVER AT FRANKFORT 1982-1988	S. ELKHORN CK NEAR MIDWAY 1987-1988	KENTUCKY RIVER AT LOCKPORT* 1982-1988	EAGLE CREEK AT GLENCOE 1982-1988
	# OF SAMPLES	82	83	30	55	82
SULFATE	MINIMUM	32	28	18	23	17
(MG/L)	MAXIMUM	148	94	134	110	90
	MEAN	63	51	55	54	45
	TREND	0	0	0	ND	0
	# OF SAMPLES	81	81	30	54	81
SUSPENDED	MINIMUM	1	1	2	1	2
SOLIDS	MAXIMUM	426	410	227	517	1180
(MG/L)	MEAN	44	37	24	55	69
	TREND	0	0	0	ND	0
	# OF SAMPLES	81	83	33	54	82
TOTAL	MINIMUM	0.02	0.01	0.02	0.05	0.01
PHOSPHOROUS	MAXIMUM	0.84	1.10	4.79	0.66	1.78
(mg/L)	MEAN	0.11	0.11	1.70	0.17	0.16
	TREND	0	0	Dec.	ND	0
	# OF SAMPLES	77	78	26	12	79
TOTAL	MINIMUM	1	1	10	10	1
ZINC	MAXIMUM	149	447	65	100	465
(ug/L)	MEAN	43	30	31	28	25
	TREND	0	0	0	ND	0
	# OF SAMPLES	81	82	30	12	81
TOTAL	MINIMUM	1	1	1	4	1
LEAD	MAXIMUM	153	44	16	32	310
(ug/L)	MEAN	9	7	4	9	11
	TREND	Dec.	0	0	ND	Dec.
	# OF SAMPLES	82	81	32	-	82
NITRITE +	MINIMUM	0.06	0.01	0.01	-	0.01
NITRATE-	MAXIMUM	3.10	3.10	13.30	-	1.66
NITROGEN	MEAN	0.66	0.78	5.20	-	0.51
(mg/L as N)	TREND	Dec.	Dec.	0	-	0

* - USGS Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

SALT RIVER BASIN

PARAMETER		ROLLING FK. AT NEW HAVEN 1985-1988	BEECH FORK AT MAUD 1984-1988	ROLLING FORK NR LEBANON JCT* 1982-1988	SALT R. AT SHEPHERDSVILLE 1982-1988	POND CREEK AT LOUISVILLE 1982-1988
STREAM FLOW(CFS)	MEASUREMENTS	-	44	29	72	79
	MINIMUM	-	0	10	38	8
	MAXIMUM	-	6660	27600	7250	650
	MEAN	-	397	2817	1050	72
	TREND	-	0	ND	0	Dec.
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	36	54	29	74	82
	MINIMUM	5.1	4.5	4.8	4.3	2.9
	MAXIMUM	14.4	15.9	12.9	14.9	14.2
	MEAN	9.1	9.1	7.8	9.9	8.5
	TREND	0	Dec.	ND	0	0
BOD (mg/L)	# OF SAMPLES	7	24	-	43	50
	MINIMUM	0.4	0.1	-	0.1	0.4
	MAXIMUM	1.4	3.5	-	5.7	8.3
	MEAN	0.9	1.2	-	1.8	2.8
	TREND	0	0	ND	0	Dec.
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	38	56	9	76	83
	MINIMUM	73	90	130	119	107
	MAXIMUM	242	504	210	530	460
	MEAN	151	185	170	190	223
	TREND	0	0	ND	Dec.	Inc.
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	38	56	29	74	82
	MINIMUM	141	162	185	250	210
	MAXIMUM	397	563	560	530	1263
	MEAN	314	381	361	391	622
	TREND	0	0	ND	0	0
pH (UNITS)	# OF SAMPLES	38	56	29	75	81
	MINIMUM	6.7	6.4	7.2	6.4	6.5
	MAXIMUM	8.3	8.4	8.2	8.9	8.7
	MEAN	7.5	7.6	7.7	7.7	7.6
	TREND	0	0	ND	0	0
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	39	56	16	75	82
	MINIMUM	47	69	117	56	66
	MAXIMUM	253	363	229	370	357
	MEAN	124	158	164	149	148
	TREND	0	0	ND	Dec.	0
CHLORIDE (MG/L)	# OF SAMPLES	39	56	29	76	83
	MINIMUM	1	1	2	3	7
	MAXIMUM	16	39	33	45	119
	MEAN	6	7	9	14	46
	TREND	0	0	ND	0	0

SALT RIVER BASIN (cont.)

PARAMETER		ROLLING FK. AT NEW HAVEN 1985-1986	BEECH FORK AT MAUD 1984-1988	ROLLING FORK NR LEBANON JCT* 1982-1988	SALT R. AT SHEPHERDSVILLE 1982-1988	POND CREEK AT LOUISVILLE 1982-1988
	# OF SAMPLES	38	56	29	75	82
SULFATE	MINIMUM	14	7	6	16	26
(MG/L)	MAXIMUM	35	106	53	70	286
	MEAN	24	32	34	36	99
	TREND	0	0	ND	0	Inc.
	# OF SAMPLES	39	56	28	75	82
SUSPENDED	MINIMUM	2	2	19	1	3
SOLIDS	MAXIMUM	1040	567	848	192	268
(MG/L)	MEAN	68	43	181	33	55
	TREND	0	0	ND	0	0
	# OF SAMPLES	38	56	28	75	81
TOTAL	MINIMUM	0.01	0.04	0.07	0.02	0.25
PHOSPHORCUS	MAXIMUM	0.90	1.62	0.72	1.11	5.36
(mg/L)	MEAN	0.09	0.23	0.26	0.31	1.46
	TREND	0	Inc.	ND	0	0
	# OF SAMPLES	39	54	3	73	80
TOTAL	MINIMUM	2	1	40	1	4
ZINC	MAXIMUM	245	177	90	181	168
(ug/L)	MEAN	32	24	63	30	43
	TREND	0	Inc.	ND	0	0
	# OF SAMPLES	39	56	3	74	82
TOTAL	MINIMUM	1	1	5	1	1
LEAD	MAXIMUM	17	24	22	410	38
(ug/L)	MEAN	3	3	12	13	9
	TREND	0	0	ND	Dec.	Dec.
	# OF SAMPLES	39	57	-	75	83
NITRITE +	MINIMUM	0.03	0.01	-	0.02	0.90
NITRATE-	MAXIMUM	2.31	2.31	-	5.41	9.80
NITROGEN	MEAN	0.74	0.77	-	1.63	2.90
(mg/L as N)	TREND	0	0	ND	0	0

* - USGS Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

GREEN RIVER BASIN

PARAMETER		GREEN RIVER AT MUNFORDVILLE 1982-1988	NOLIN RIVER AT WHITE MILLS 1982-1988	BACON CREEK AT PRICEVILLE 1983-1988	BARREN R. AT BOWLING GREEN 1982-1988	GREEN RIVER AT MORGANTOWN 1982-1988
STREAM FLOW(CFS)	MEASUREMENTS	80	80	68	80	48
	MINIMUM	186	8	6	114	600
	MAXIMUM	17800	4690	316	8630	48200
	MEAN	2785	392	45	2660	8660
	TREND	0	0	Dec.	0	Dec.
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	83	83	71	73	80
	MINIMUM	6.4	6.2	6.4	6.1	5.4
	MAXIMUM	14.1	12.8	13.2	13.3	14.4
	MEAN	9.7	9.2	9.6	9.1	9.2
	TREND	0	0	0	0	0
BOD (mg/L)	# OF SAMPLES	51	51	39	52	52
	MINIMUM	0.1	0.1	0.1	0.1	0.1
	MAXIMUM	2.4	3.4	1.7	6.1	5.5
	MEAN	0.7	0.9	0.6	1.5	1.1
	TREND	0	Inc.	0	0	0
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	83	83	71	84	84
	MINIMUM	57	54	82	90	54
	MAXIMUM	283	399	372	325	260
	MEAN	121	172	168	135	128
	TREND	0	0	0	Inc.	0
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	83	82	71	83	83
	MINIMUM	125	108	163	80	110
	MAXIMUM	500	735	398	559	377
	MEAN	268	381	323	249	260
	TREND	0	Inc.	0	0	Inc.
pH (UNITS)	# OF SAMPLES	83	81	70	83	84
	MINIMUM	6.8	6.6	6.7	6.5	6.5
	MAXIMUM	8.7	8.6	8.7	8.2	8.7
	MEAN	7.5	7.4	7.5	7.9	7.5
	TREND	Inc.	Inc.	Inc.	0	Inc.
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	80	80	68	82	82
	MINIMUM	42	48	74	51	45
	MAXIMUM	179	315	800	224	222
	MEAN	94	150	176	106	105
	TREND	0	0	Inc.	Inc.	Inc.
CHLORIDE (MG/L)	# OF SAMPLES	83	83	71	83	83
	MINIMUM	4	4	3	2	3
	MAXIMUM	75	98	18	99	23
	MEAN	21	23	6	10	11
	TREND	0	Inc.	Dec.	0	0

GREEN RIVER BASIN (cont.)

PARAMETER		GREEN RIVER AT MUNFORDVILLE 1982-1988	NOLIN RIVER AT WHITE MILLS 1982-1988	BACON CREEK AT PRICEVILLE 1983-1988	BARREN R. AT BOWLING GREEN 1982-1988	GREEN RIVER AT MORGANTOWN 1982-1988
SULFATE (MG/L)	# OF SAMPLES	83	83	71	83	84
	MINIMUM	8	4	2	6	8
	MAXIMUM	107	60	9	29	1200
	MEAN	15	11	5	16	85
	TREND	Inc.	Inc.	0	Inc.	0
SUSPENDED SOLIDS (MG/L)	# OF SAMPLES	80	80	68	82	83
	MINIMUM	3	1	1	1	5
	MAXIMUM	252	291	294	907	426
	MEAN	36	31	27	40	44
	TREND	Inc.	Inc.	Inc.	0	0
TOTAL PHOSPHOROUS (mg/L)	# OF SAMPLES	82	82	70	83	83
	MINIMUM	0.01	0.01	0.01	0.01	0.02
	MAXIMUM	1.33	0.52	0.33	0.67	0.36
	MEAN	0.08	0.14	0.04	0.05	0.07
	TREND	0	Inc.	0	0	0
TOTAL ZINC (ug/L)	# OF SAMPLES	81	80	68	79	81
	MINIMUM	1	1	1	1	1
	MAXIMUM	756	144	109	523	99
	MEAN	29	18	17	28	24
	TREND	Inc.	Inc.	Inc.	0	0
TOTAL LEAD (ug/L)	# OF SAMPLES	82	82	70	81	83
	MINIMUM	1	1	1	1	1
	MAXIMUM	87	136	59	290	26
	MEAN	5	8	4	16	5
	TREND	Dec.	0	0	0	Dec.
NITRITE + NITRATE-NITROGEN (mg/L as N)	# OF SAMPLES	82	83	71	82	84
	MINIMUM	0.18	0.8	0.04	0.16	0.09
	MAXIMUM	1.91	14.7	2.15	2.63	1.91
	MEAN	0.84	2.8	1.14	1.11	1.11
	TREND	0	0	0	0	0

0 - No Trend
Inc. - Increasing
Dec. - Decreasing

GREEN RIVER BASIN (cont.)

PARAMETER		MUD RIVER AT LEWISBURG 1982-1988	ROUGH RIVER NR DUNDEE 1982-1988	POND RIVER NEAR APEX 1982-1988	POND RIVER NR SACREMENTO 1982-1988	GREEN RIVER NEAR SEBREE* 1982-1988
	MEASUREMENTS	-	82	80	-	82
STREAM	MINIMUM	-	58	0	-	1300
FLOW(CFS)	MAXIMUM	-	4490	2290	-	80900
	MEAN	-	1035	245	-	14000
	TREND	-	0	0	-	ND
	# OF SAMPLES	81	84	82	83	83
DISSOLVED	MINIMUM	1.9	4.7	4.1	4.1	5.6
OXYGEN	MAXIMUM	15.2	16.6	14.2	13.2	12.7
(mg/L)	MEAN	7.1	8.9	8.9	8.2	8.9
	TREND	0	0	0	Inc.	ND
	# OF SAMPLES	52	52	52	52	75
BOD	MINIMUM	0.1	0.1	0.1	0.1	0.3
(mg/L)	MAXIMUM	6.1	2.1	4.1	3.5	7.1
	MEAN	1.2	0.9	1.4	1.1	1.9
	TREND	0	0	0	0	ND
	# OF SAMPLES	83	84	83	84	84
TOTAL	MINIMUM	44	55	68	60	16
HARDNESS	MAXIMUM	356	192	290	1310	341
(mg/L AS	MEAN	171	101	133	403	159
CACO3)	TREND	0	0	0	0	Inc.
	# OF SAMPLES	84	83	83	84	78
SPECIFIC	MINIMUM	77	100	105	100	110
CONDUCTANCE	MAXIMUM	653	306	724	2583	690
(uS/CM)	MEAN	382	205	305	854	350
	TREND	Inc.	0	0	0	ND
	# OF SAMPLES	81	83	83	84	82
pH	MINIMUM	6.1	6.7	6.4	4.4	6.9
(UNITS)	MAXIMUM	7.8	8.6	8.3	8.1	8.1
	MEAN	7.1	7.3	7.3	6.8	7.3
	TREND	0	Inc.	0	0	ND
	# OF SAMPLES	82	82	81	82	-
ALKALINITY	MINIMUM	34	32	41	1	-
(mg/L AS	MAXIMUM	386	194	251	182	-
CACO3)	MEAN	156	81	98	55	-
	TREND	0	0	0	Inc.	-
	# OF SAMPLES	83	83	82	83	41
CHLORIDE	MINIMUM	1	1	1	1	4
(MG/L)	MAXIMUM	83	16	98	104	25
	MEAN	16	6	17	15	12
	TREND	Inc.	Inc.	0	0	ND

GREEN RIVER BASIN (cont.)

PARAMETER		MUD RIVER AT LEWISBURG 1982-1988	ROUGH RIVER NR DUNDEE 1982-1988	POND RIVER NEAR APEX 1982-1988	POND RIVER NR SACREMENTO 1982-1988	GREEN RIVER NEAR SEBREE* 1982-1988
	# OF SAMPLES	84	83	83	84	84
SULFATE	MINIMUM	5	4	11	4	8
(MG/L)	MAXIMUM	1580	858	1800	2500	218
	MEAN	70	42	77	408	70
	TREND	0	0	0	Dec.	Inc.
	# OF SAMPLES	83	83	82	83	83
SUSPENDED	MINIMUM	2	4	2	2	5
SOLIDS	MAXIMUM	598	900	3000	286	342
(MG/L)	MEAN	47	60	105	38	55
	TREND	Inc.	0	0	0	0
	# OF SAMPLES	83	83	82	83	83
TOTAL	MINIMUM	0.02	0.01	0.01	0.01	0.02
PHOSPHOROUS	MAXIMUM	0.96	0.49	0.65	0.36	0.32
(mg/L)	MEAN	0.13	0.06	0.08	0.05	0.09
	TREND	0	0	0	Dec.	Dec.
	# OF SAMPLES	81	81	80	81	84
TOTAL	MINIMUM	1	1	1	4	8
ZINC	MAXIMUM	158	179	120	621	600
(ug/L)	MEAN	26	28	21	63	32
	TREND	0	0	0	Dec.	Dec.
	# OF SAMPLES	83	83	81	83	84
TOTAL	MINIMUM	1	1	1	1	2
LEAD	MAXIMUM	28	30	40	262	205
(ug/L)	MEAN	6	5	6	10	14
	TREND	Dec.	0	Dec.	Dec.	Dec.
	# OF SAMPLES	83	83	82	83	84
NITRITE +	MINIMUM	0.03	0.11	0.01	0.01	0.09
NITRATE-	MAXIMUM	3.51	2.31	2.14	1.89	-
NITROGEN	MEAN	1.62	0.77	0.52	0.62	1.56
(mg/L as N)	TREND	0	0	0	Dec.	Inc.

* - ORSANCO Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

TRADEWATER RIVER BASIN

PARAMETER		TRADEWATER AT OLNEY 1984-1988
	MEASUREMENTS	34
STREAM	MINIMUM	0.1
FLOW(CFS)	MAXIMUM	2000
	MEAN	317
	TREND	Dec.
	# OF SAMPLES	56
DISSOLVED	MINIMUM	2.6
OXYGEN	MAXIMUM	13.6
(mg/L)	MEAN	7.1
	TREND	0
	# OF SAMPLES	25
BOD	MINIMUM	0.1
(mg/L)	MAXIMUM	3.5
	MEAN	1.2
	TREND	0
	# OF SAMPLES	55
TOTAL	MINIMUM	48
HARDNESS	MAXIMUM	531
(mg/L AS	MEAN	170
CACO3)	TREND	0
	# OF SAMPLES	56
SPECIFIC	MINIMUM	117
CONDUCTANCE	MAXIMUM	1002
(uS/CM)	MEAN	375
	TREND	0
	# OF SAMPLES	56
pH	MINIMUM	5.1
(UNITS)	MAXIMUM	7.3
	MEAN	6.7
	TREND	Inc.
	# OF SAMPLES	54
ALKALINITY	MINIMUM	9
(mg/L AS	MAXIMUM	105
CACO3)	MEAN	41
	TREND	Inc.

PARAMETER		TRADEWATER AT OLNEY 1984-1988
	# OF SAMPLES	56
CHLORIDE	MINIMUM	1
(MG/L)	MAXIMUM	37
	MEAN	6
	TREND	Inc.
	# OF SAMPLES	55
SULFATE	MINIMUM	29
(MG/L)	MAXIMUM	480
	MEAN	122
	TREND	0
	# OF SAMPLES	54
SUSPENDED	MINIMUM	2
SOLIDS	MAXIMUM	115
(MG/L)	MEAN	16
	TREND	Dec.
	# OF SAMPLES	55
TOTAL	MINIMUM	0.01
PHOSPHOROUS	MAXIMUM	0.12
(mg/L)	MEAN	0.03
	TREND	0
	# OF SAMPLES	53
TOTAL	MINIMUM	5
ZINC	MAXIMUM	139
(ug/L)	MEAN	32
	TREND	0
	# OF SAMPLES	55
TOTAL	MINIMUM	1
LEAD	MAXIMUM	19
(ug/L)	MEAN	2
	TREND	0
	# OF SAMPLES	55
NITRITE +	MINIMUM	0.01
NITRATE-	MAXIMUM	1.16
NITROGEN	MEAN	0.31
(mg/L as N)	TREND	Dec.

0 - NO TREND
Inc. - Increasing
Dec. - Decreasing

PARAMETER		CLARKS R. AT ALMO 1984-1988	TENNESSEE R. NR PADUCAH 1982-1989*
	MEASUREMENTS	46	-
STREAM	MINIMUM	3	-
FLOW(CFS)	MAXIMUM	3510	-
	MEAN	120	-
	TREND	Dec.	-
	# OF SAMPLES	55	84
DISSOLVED	MINIMUM	3.9	4.3
OXYGEN	MAXIMUM	13.2	18.8
(mg/L)	MEAN	7.5	9.8
	TREND	0	ND
	# OF SAMPLES	24	77
BOD	MINIMUM	0.1	0.3
(mg/L)	MAXIMUM	6.7	6.8
	MEAN	2.1	1.8
	TREND	0	ND
	# OF SAMPLES	57	83
TOTAL	MINIMUM	20	55
HARDNESS	MAXIMUM	81	119
(mg/L AS	MEAN	42	75
CACO3)	TREND	0	ND
	# OF SAMPLES	57	84
SPECIFIC	MINIMUM	54	13
CONDUCTANCE	MAXIMUM	250	240
(uS/CM)	MEAN	168	180
	TREND	Inc.	ND
	# OF SAMPLES	56	82
pH	MINIMUM	5.7	6.8
(UNITS)	MAXIMUM	8.4	9.1
	MEAN	6.9	7.5
	TREND	Inc.	ND
	# OF SAMPLES	54	-
ALKALINITY	MINIMUM	13	-
(mg/L AS	MAXIMUM	61	-
CACO3)	MEAN	37	-
	TREND	Inc.	-
	# OF SAMPLES	57	41
CHLORIDE	MINIMUM	3	5
(MG/L)	MAXIMUM	27	21
	MEAN	15	13
	TREND	Inc.	ND

PARAMETER		CLARKS R. AT ALMO 1984-1988	TENNESSEE R. NR PADUCAH 1982-1989*
	# OF SAMPLES	56	84
SULFATE	MINIMUM	6	2
(MG/L)	MAXIMUM	58	29
	MEAN	14	15
	TREND	Dec.	ND
	# OF SAMPLES	55	84
SUSPENDED	MINIMUM	3	1
SOLIDS	MAXIMUM	377	50
(MG/L)	MEAN	27	13
	TREND	0	ND
	# OF SAMPLES	56	69
TOTAL	MINIMUM	0.12	0.03
PHOSPHOROUS	MAXIMUM	1.96	2.41
(mg/L)	MEAN	0.73	0.35
	TREND	Inc.	ND
	# OF SAMPLES	54	84
TOTAL	MINIMUM	1	4
ZINC	MAXIMUM	86	144
(ug/L)	MEAN	21	18
	TREND	0	ND
	# OF SAMPLES	56	84
TOTAL	MINIMUM	1	2
LEAD	MAXIMUM	280	185
(ug/L)	MEAN	10	14
	TREND	0	ND
	# OF SAMPLES	56	84
NITRITE +	MINIMUM	0.15	0.01
NITRATE-	MAXIMUM	4.81	1.46
NITROGEN	MEAN	2.25	0.29
(mg/L as N)	TREND	0	ND

* - ORSANCO Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

UPPER CUMBERLAND RIVER BASIN

PARAMETER		CUMBERLAND R. AT PINEVILLE 1982-1988	CUMBERLAND R. AT CUMB. FALLS 1982-1988	ROCKCASTLE R. AT BILLOWS 1982-1988	S. FK CUMB. R. AT YAMACRAW 1982-1988	CUMBERLAND R. AT BURKESVILLE 1982-1988
STREAM FLOW(CFS)	MEASUREMENTS	78	77	76	53	57
	MINIMUM	68	130	4	33	6
	MAXIMUM	17600	13200	14900	7160	30600
	MEAN	1500	2636	872	1360	8600
	TREND	0	0	0	0	0
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	80	81	78	80	82
	MINIMUM	5.4	5.2	4.6	5.2	6.4
	MAXIMUM	15.2	15.8	14.3	15.2	12.8
	MEAN	9.2	9.5	9.1	9.3	10.1
	TREND	0	0	0	Inc.	Inc.
BOD (mg/L)	# OF SAMPLES	50	50	50	51	53
	MINIMUM	0.1	0.1	0.1	0.1	0.1
	MAXIMUM	6.6	2.2	2.7	2.2	1.8
	MEAN	1.1	0.7	0.8	0.6	0.6
	TREND	Inc.	0	0	0	0
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	81	81	80	80	83
	MINIMUM	67	64	45	23	58
	MAXIMUM	366	278	262	155	214
	MEAN	131	121	97	63	83
	TREND	0	0	0	0	Inc.
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	81	81	78	80	82
	MINIMUM	100	100	80	60	139
	MAXIMUM	755	612	464	340	234
	MEAN	366	317	199	160	166
	TREND	0	0	0	Dec.	Inc.
pH (UNITS)	# OF SAMPLES	81	81	77	80	83
	MINIMUM	6.2	6.4	6.4	6.1	6.7
	MAXIMUM	8.5	8.9	8.3	8.4	8.8
	MEAN	7.3	7.3	7.3	7.1	7.4
	TREND	0	0	0	Inc.	Inc.
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	80	79	78	79	81
	MINIMUM	29	21	30	8	30
	MAXIMUM	180	150	123	60	363
	MEAN	80	61	61	20	52
	TREND	0	0	0	Inc.	0
CHLORIDE (MG/L)	# OF SAMPLES	80	78	76	78	81
	MINIMUM	1	1	1	1	1
	MAXIMUM	24	52	21	146	13
	MEAN	7	7	5	8	4
	TREND	0	0	Inc.	0	Inc.

PARAMETER		CUMBERLAND R. AT PINEVILLE 1982-1988	CUMBERLAND R. AT CUMB. FALLS 1982-1988	ROCKCASTLE R. AT BILLOWS 1982-1988	S. FK CUMB. R. AT YAMACRAW 1982-1988	CUMBERLAND R. AT BURKESVILLE 1982-1988
SULFATE (MG/L)	# OF SAMPLES	81	80	80	80	82
	MINIMUM	12	17	15	17	14
	MAXIMUM	432	174	88	98	41
	MEAN	100	87	33	44	32
	TREND	Inc.	0	0	0	Inc.
SUSPENDED SOLIDS (MG/L)	# OF SAMPLES	79	74	78	74	77
	MINIMUM	2	1	1	1	1
	MAXIMUM	1340	266	158	235	141
	MEAN	61	41	9	17	10
	TREND	0	0	Dec.	0	0
TOTAL PHOSPHOROUS (mg/L)	# OF SAMPLES	81	81	79	80	82
	MINIMUM	0.01	0.01	0.01	0.01	0.01
	MAXIMUM	0.36	0.27	0.18	0.15	0.12
	MEAN	0.07	0.05	0.03	0.02	0.01
	TREND	Dec.	Dec.	Dec.	Dec.	Dec.
TOTAL ZINC (ug/L)	# OF SAMPLES	77	77	77	77	80
	MINIMUM	1	1	1	2	1
	MAXIMUM	104	120	135	930	97
	MEAN	22	21	21	30	16
	TREND	0	0	0	0	0
TOTAL LEAD (ug/L)	# OF SAMPLES	79	79	77	79	82
	MINIMUM	1	1	1	1	1
	MAXIMUM	72	40	92	134	20
	MEAN	7	5	7	6	4
	TREND	0	0	0	Dec.	0
NITRITE + NITRATE-NITROGEN (mg/L as N)	# OF SAMPLES	80	81	79	80	83
	MINIMUM	0.14	0.01	0.01	0.01	0.23
	MAXIMUM	1.17	0.63	0.84	0.36	0.57
	MEAN	0.42	0.31	0.35	0.15	0.41
	TREND	Dec.	0	0	0	0

0 - No Trend
Inc. - Increasing
Dec. - Decreasing

LOWER CUMBERLAND RIVER BASIN

PARAMETER		CUMBERLAND R. NR GRAND R. 1982-1989*
STREAM FLOW(CFS)	MEASUREMENTS	-
	MINIMUM	-
	MAXIMUM	-
	MEAN	-
	TREND	-
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	78
	MINIMUM	5.1
	MAXIMUM	14.4
	MEAN	9.4
	TREND	ND
BOD (mg/L)	# OF SAMPLES	43
	MINIMUM	0.3
	MAXIMUM	3.7
	MEAN	1.5
	TREND	ND
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	76
	MINIMUM	15
	MAXIMUM	163
	MEAN	99
	TREND	ND
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	78
	MINIMUM	10
	MAXIMUM	300
	MEAN	212
	TREND	ND
pH (UNITS)	# OF SAMPLES	77
	MINIMUM	6.8
	MAXIMUM	8.6
	MEAN	7.7
	TREND	ND
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	-
	MINIMUM	-
	MAXIMUM	-
	MEAN	-
	TREND	-

PARAMETER		CUMBERLAND R. NR GRAND R. 1982-1989*
CHLORIDE (MG/L)	# OF SAMPLES	22
	MINIMUM	6
	MAXIMUM	18
	MEAN	11
	TREND	ND
SULFATE (MG/L)	# OF SAMPLES	75
	MINIMUM	8
	MAXIMUM	108
	MEAN	23
	TREND	ND
SUSPENDED SOLIDS (MG/L)	# OF SAMPLES	78
	MINIMUM	2
	MAXIMUM	55
	MEAN	14
	TREND	ND
TOTAL PHOSPHOROUS (mg/L)	# OF SAMPLES	38
	MINIMUM	0.03
	MAXIMUM	2.40
	MEAN	0.38
	TREND	ND
TOTAL ZINC (ug/L)	# OF SAMPLES	76
	MINIMUM	5
	MAXIMUM	176
	MEAN	27
	TREND	ND
TOTAL LEAD (ug/L)	# OF SAMPLES	77
	MINIMUM	2
	MAXIMUM	430
	MEAN	14
	TREND	ND
NITRITE + NITRATE- NITROGEN (mg/L as N)	# OF SAMPLES	44
	MINIMUM	0.01
	MAXIMUM	0.88
	MEAN	0.20
	TREND	ND

* - ORSANCO Station
0 - No Trend
Inc. - Increasing
Dec. - Decreasing
ND - Not Determined

PARAMETER		BAYOU DE CHIEN NR CLINTON 1984-1988
STREAM FLOW(CFS)	MEASUREMENTS	42
	MINIMUM	14
	MAXIMUM	1980
	MEAN	98
	TREND	0
DISSOLVED OXYGEN (mg/L)	# OF SAMPLES	55
	MINIMUM	4.4
	MAXIMUM	13.2
	MEAN	8.2
	TREND	Inc.
BOD (mg/L)	# OF SAMPLES	24
	MINIMUM	0.1
	MAXIMUM	6.7
	MEAN	1.3
	TREND	0
TOTAL HARDNESS (mg/L AS CACO3)	# OF SAMPLES	57
	MINIMUM	20
	MAXIMUM	65
	MEAN	33
	TREND	Dec.
SPECIFIC CONDUCTANCE (uS/CM)	# OF SAMPLES	57
	MINIMUM	50
	MAXIMUM	171
	MEAN	92
	TREND	Dec.
pH (UNITS)	# OF SAMPLES	56
	MINIMUM	5.7
	MAXIMUM	8.9
	MEAN	6.9
	TREND	Inc.
ALKALINITY (mg/L AS CACO3)	# OF SAMPLES	55
	MINIMUM	15
	MAXIMUM	63
	MEAN	31
	TREND	0

PARAMETER		BAYOU DE CHIEN NR CLINTON 1984-1988
CHLORIDE (MG/L)	# OF SAMPLES	57
	MINIMUM	1
	MAXIMUM	10
	MEAN	5
	TREND	0
SULFATE (MG/L)	# OF SAMPLES	54
	MINIMUM	4
	MAXIMUM	1400
	MEAN	79
	TREND	0
SUSPENDED SOLIDS (MG/L)	# OF SAMPLES	55
	MINIMUM	1
	MAXIMUM	1330
	MEAN	52
	TREND	Dec.
TOTAL PHOSPHOROUS (mg/L)	# OF SAMPLES	56
	MINIMUM	0.03
	MAXIMUM	1.1
	MEAN	0.12
	TREND	0
TOTAL ZINC (ug/L)	# OF SAMPLES	54
	MINIMUM	1
	MAXIMUM	81
	MEAN	18
	TREND	0
TOTAL LEAD (ug/L)	# OF SAMPLES	56
	MINIMUM	1
	MAXIMUM	29
	MEAN	5
	TREND	Inc.
NITRITE + NITRATE-NITROGEN (mg/L as N)	# OF SAMPLES	56
	MINIMUM	0.03
	MAXIMUM	1.91
	MEAN	0.43
	TREND	Dec.

0 - No Trend
Inc. - Increasing
Dec. - Decreasing

APPENDIX B

FISH KILL INVESTIGATIONS SUMMARY 1988-89

Appendix B
Fish Kill Investigations Summary (1988)

County	Waterbody	Date	Miles Affected	Cause	Number of Fish
Bourbon	Houston Creek	7-15-88	0.50	Eutrophication (natural)	3,000
Bourbon	Stoner Creek	7-15-88	9.50	Eutrophication (natural)	10,000
Bourbon	Stoner Creek	10-18-88	0.50	Chlorine (WWTP)	200
Campbell	Twelve Mile Creek	10-19-88	0.10	Low dissolved oxygen	100
Daviess	Ohio River	8-22-88	0.34	Vinylidene chloride	19,491
Fayette	West Hickman Ck.	6-14-88	2.27	Organic enrichment - municipal WWTP	36,268
Franklin	Kentucky River	8-19-88	0.37	Unknown	2,538
Grayson	Beaverdam Creek	3-14-88	1.44	Organic enrichment - animal wastes	607
Hardin	Otter Creek	10-17-88	8.27	Hydrochloric acid	27,663
Harlan	Greasy Creek	6-21-88	1.50	Coal mine sub-sidence	6,159
Jefferson	Beargrass Creek	5-16-88	2.00	Unknown	1,000
Jefferson	Beargrass Creek	7-14-88	0.50	Recycled oil discharge	500
Jefferson	Ohio River	7-06-88	2.00	Thermal discharge	500
Livingston	Ohio River	8-25-88	70.00	Unknown	66,380
Monroe	Curtis Branch and Mill Creek	9-19-88	3.20	Tacking oil discharge	400
Muhlenberg	Green River	2-21-88	-	Thermal discharge	135,171
Oldham	Unnamed tributary to Floyd's Fork	8-22-88	0.57	Organic enrichment - municipal WWTP	8,835
Pulaski	Sinking Creek	8-14-88	1.50	Organic enrichment - municipal WWTP	400
Scott	N. Fk. Elkhorn Ck.	7-15-88	1.00	Eutrophication (natural)	-
Total: 19	16 waterbodies	15 dates	105.56 mi.	10 known causes	319,212

Fish Kill Investigations Summary (1989)

County	Waterbody	Date	Miles Affected	Cause	Number of Fish
Adair	Barnett's Creek	4-21-89	0.50	pH	500
Boyd	East Fork - Little Sandy River	8-08-89	0.60	Chlorine	479
Boyle	Herrington Lake	4-28-89	5.00	Unknown	2,000
Boyle	Herrington Lake	9-17-89	4.00	Eutrophication (natural)	2,000
Breckinridge	Hardin's Fork	10-05-89	0.25	Organic enrichment (municipal WWTP)	1,165
Cumberland	Otter Creek and Bear Creek	10-25-89	3.00	Crude oil discharge	NC*
Fayette	North Fork Elkhorn Creek	6-01-89	2.00	Unknown	NC
Fayette	West Hickman Creek	4-23-89	2.00	Chlorine	17,200
Fayette	East Hickman Creek	8-03-89	-	Organic enrichment	NC
Fayette	Reservoirs No. 2 & 3	5-12-89	-	Unknown	NC
Henderson	Highland Creek	5-15-89	15.00	Unknown	150
Jefferson	Goose Creek	3-16-89	0.98	Chlorine	392
Jefferson	McNeely Lake	3-27-89	0.00	Unknown	NC
Jefferson	Beargrass Creek	7-13-89	0.50	Organic enrichment (municipal WWTP)	NC
Jefferson	Pond Creek	7-13-89	0.50	Low dissolved oxygen	NC
Lawrence	Dry Fork	6-07-89	3.50	Organic enrichment (animal waste)	1,600
Madison	Otter Creek	10-31-89	11.75	Ammonia	18,000
Marshall	Cypress Creek	7-20-89	1.00	Low dissolved oxygen	427

Fish Kill Investigations Summary (1989) (Continued)

County	Waterbody	Date	Miles Affected	Cause	Number of Fish
Nelson	Pottinger Creek	4-22-89	3.60	Organic enrichment (animal waste)	8,280
Pulaski	Big Spring Branch	7-06-89	0.50	Chlorine	100
Shelby	Clear Creek	5-11-89	-	Paint remover	NC
Taylor	Little Pittman Ck.	9-01-89	2.10	Miscible oil	8,037
Todd	Little Clifty Ck.	9-04-89	-	Sawmill runoff	NC
Total: 23 fish kills	23 waterbodies	22 dates	47.78 mi	11 known causes	222,2330

*NC = Not counted

APPENDIX C

LAKE INFORMATION AND EXPLANATORY CODES

Appendix C
Lake Information and Explanatory Codes

COLUMN HEADER	DEFINITION
LAKE NAME	the name of the waterbody as shown on USGS topographic map
TOTAL ACREAGE	size of lake at summer pool or normal seasonal levels
USGS QUADRANGLE	quadrangle where the dam or waterbody is located
LATITUDE\LONGITUDE	location of the dam by degrees, minutes, and seconds
WATERBODY SYSTEM NUMBER	a stream identification number assigned by the Division of Water
COUNTY NAME	the name of the county where the dam or lake is located
RIVER BASIN	the name of the major river basin in which the waterbody is located
SUBBASIN	the name of the waterbody that receives the discharge from the lake or reservoir

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
A.J.JOLLY LAKE	204	ALEXANDRIA	38-52-59	84-22-27	KY5100101-006L01	CAMPBELL	LICKING	PHILLIPS CREEK
ARROWHEAD LAKE	37	CAIRO,ILL-KY	37-01-50	89-07-20	KY8010100-002L02	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
BARREN RIVER LAKE	10000	LUCAS	36-55-34	86-02-28	KY5110002-013	BARREN\ALLEN	GREEN	BARREN RIVER
BEAVER LAKE	158	ASHBROOK	37-57-45	85-01-20	KY5140103-021L01	ANDERSON	SALT	BEAVER CREEK
BERT COMBS LAKE	36	BARCREEK	37-10-00	83-42-27	KY5100203-009L01	CLAY	KENTUCKY	BEECH CREEK
BOLTZ LAKE	92	WILLIAMSTOWN	38-42-12	84-36-45	KY5100205-004L02	GRANT	KENTUCKY	ARNOLDS CREEK
BRIGGS LAKE	18	HOMER	36-53-21	86-49-49	KY5110003-009L01	LOGAN	GREEN	MUD RIVER
BUCK LAKE	19	BARLOW,KY-ILL	37-02-26	89-05-22	KY8010100-001L03	BALLARD	MISSISSIPPI	SHAWNEE CREEK
BUCKHORN LAKE	1230	BUCKHORN	37-18-16	83-26-54	KY5100202-003	PERRY\LESLIE	KENTUCKY	M.F.KENTUCKY RIVER
BULLOCK PEN LAKE	134	VERONA	38-47-36	84-38-41	KY5100205-004L01	GRANT	KENTUCKY	BULLOCK PEN CREEK
BURNT POND	10	BARLOW,KY-ILL	37-02-40	89-07-02	KY8010100-002L03	BALLARD	MISSISSIPPI	DEEP SLOUGH
CAMPBELLSVILLE CITY RESERVOIR	63	CAMPBELLSVILLE	37-21-31	85-20-17	KY5110001-026L01	TAYLOR	GREEN	TRACE FORK,L.PITMAN CREEK
CAMPTON LAKE	26	CAMPTON	37-44-42	83-32-37	KY5100204-022L01	WOLFE	KENTUCKY	HIRAM BR,SWIFT CAMP CREEK
CANEYVILLE CITY RESERVOIR	75	CANEYVILLE	37-26-34	86-27-42	KY5110004-008L01	GRAYSON	GREEN	NF CANEY CREEK
CANNON CREEK LAKE	243	MIDDLESBORO NORTH	36-40-51	83-42-08	KY5130101-031L01	BELL	UPPER CUMBERLAND	CANNON CREEK
CARPENTER LAKE	64	MACEO	37-50-51	86-58-51	KY5140201-001L01	DAVIESS	OHIO	UT TO PUP CREEK
CARR FORK LAKE	710	VICCO	37-14-04	83-00-03	KY5100201-015	KNOTT\PERRY	KENTUCKY	CARR FORK,KENTUCKY RIVER
CAVE RUN LAKE	8270	SALT LICK	38-03-03	83-29-42	KY5100101-026	ROWAN\BATH	LICKING	N\A
CHENOA LAKE	37	KAYJAY	36-40-33	83-51-07	KY5130101-029L01	BELL	UPPER CUMBERLAND	CLEAR CREEK
CORBIN CITY RESERVOIR	139	CORBIN	36-59-23	87-07-07	KY5130101-006	LAUREL	UPPER CUMBERLAND	LAUREL RIVER
CORINTH LAKE	96	MASON	38-30-00	84-34-56	KY5100205-008L01	GRANT	KENTUCKY	THREE FORKS CREEK
CRANKS CREEK LAKE	219	HUBBARD SPRINGS,VA	36-44-23	83-13-12	KY5130101-038L02	HARLAN	UPPER CUMBERLAND	CRANKS CREEK
DALE HOLLOW LAKE	4300	DALE HOLLOW DAM,TN	36-36-31	85-19-29	KY5130105-001	CUMBERLAND\CLINTON	UPPER CUMBERLAND	OBEY RIVER
DEWEY LAKE	1100	DEWEY LAKE	37-41-39	82-42-22	KY5070203-012	FLOYD	BIG SANDY	LEVISA FORK
DOE RUN LAKE	51	INDEPENDENCE	38-59-19	84-33-07	KY5100101-002L01	KENTON	LICKING	BULLOCK PEN CREEK
ELMER DAVIS LAKE	149	GRATZ	38-29-31	84-52-40	KY5100205-015L01	OWEN	KENTUCKY	NORTH SEVERN CREEK
ENERGY LAKE	370	MONT	36-51-30	88-01-26	KY5130205-016L01	TRIGG	LOWER CUMBERLAND	CROOKED CREEK
FISH LAKE	27	BARLOW,KY-ILL	37-03-00	89-05-30	KY8010100-001L02	BALLARD	MISSISSIPPI	SHAWNEE CREEK
FISHPOND LAKE	32	JENKINS WEST	37-09-42	83-40-39	KY5100201-022L01	LETCHER	KENTUCKY	FISHPOND BRANCH

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
FISHTRAP LAKE	1143	MILLARD	37-25-39	82-22-12	KY5070202-008	PIKE	BIG SANDY	LEVISA FORK
FLAT LAKE	38	BARLOW,KY-ILL	37-02-30	89-05-57	KY8010100-001L01	BALLARD	MISSISSIPPI	UT TO SHAWNEE CREEK
FREEMAN LAKE	160	ELIZABETHTOWN	37-43-15	85-52-17	KY5110001-012L01	HARDIN	GREEN	FREEMAN CREEK
GENERAL BUTLER ST.PK. LAKE	29	CARROLLTON	38-40-04	85-08-54	KY5100205-002L01	CARROLL	KENTUCKY	UT TO KENTUCKY RIVER
GRAPEVINE LAKE	50	MADISONVILLE EAST	37-16-16	87-28-40	KY5110006-005L01	HOPKINS	GREEN	UT TO FLAT CREEK
GRAYSON LAKE	1512	GRAYSON	38-11-48	83-02-36	KY5090104-008	CARTER\ELLIOTT	LITTLE SANDY	N\A
GREENBRIAR LAKE	65	PRESTON	38-01-11	83-51-34	KY5100101-022L01	MONTGOMERY	LICKING	GREENBRIAR CREEK
GREENBO LAKE	181	ARGILLITE	38-29-19	85-52-04	KY5090104-007L01	GREENUP	LITTLE SANDY	CLAYLICK CREEK
GREEN RIVER LAKE	8210	CANE VALLEY	37-14-59	85-20-02	KY511001-033	ADAIR\TAYLOR	GREEN	N\A
GUIST CREEK LAKE	317	SHELBYVILLE	38-12-28	85-08-31	KY5140102-021L01	SHELBY	SALT	GUIST CREEK
HEMATITE LAKE	90	MONT	36-53-44	88-02-53	KY5130205-016L03	TRIGG	LOWER CUMBERLAND	LONG CREEK
HERRINGTON LAKE	2940	WILMORE	37-44-45	84-42-14	KY5100205-038	MERCER\GARRARD	KENTUCKY	DIX RIVER
HONKER LAKE	190	MONT	36-54-22	88-01-47	KY5130205-016L02	TRIGG	LOWER CUMBERLAND	LONG CREEK
KENTUCKY LAKE	48100	GRAND RIVERS	36-29-52	88-02-42	KY6040005-001	MARSHALL\LIVINGSTON	TENNESSEE	N\A
KINCAID LAKE	183	FALMOUTH	38-42-57	84-16-36	KY5100101-008L01	PENDLETON	LICKING	KINCAID CREEK
KINGFISHER LAKE	30	MACEO	37-50-42	86-58-35	KY5140201-001L02	DAVIESS	OHIO	PUP CREEK
LAKE BARKLEY	45600	GRAND RIVERS	36-44-12	87-57-58	KY5130205-006	LIVINGSTON\LYON	LOWER CUMBERLAND	N\A
LAKE BESHEAR	760	DAWSON SPRINGS	37-08-23	87-40-57	KY5140205-014L01	CALDWELL\CHRISTIAN	TRADEWATER	FINEY CREEK
LAKE BLYTHE	89	KELLY	36-55-32	87-30-00	KY5130205-009L01	CHRISTIAN	LOWER CUMBERLAND	WHITE CREEK
LAKE CARNICO	114	CARLISLE	38-20-48	84-02-30	KY5100102-020L01	NICHOLAS	LICKING	BRUSHY CREEK
LAKE CUMBERLAND	50250	WOLF CREEK DAM	36-54-47	84-58-43	KY5130103-010	RUSSELL\CLINTON	UPPER CUMBERLAND	N\A
LAKE GEORGE	53	MARION	37-17-49	88-05-25	KY5140203-004L01	CRITTENDEN	OHIO	UT TO CROOKED CREEK
LAKE JERICHO	137	SMITHFIELD	38-27-07	85-16-56	KY5140101-006L01	HENRY	LITTLE KENTUCKY	N\A
LAKE LINVILLE	273	WILDIE	37-23-20	84-20-40	KY5130102-007L01	ROCKCASTLE	UPPER CUMBERLAND	RENFRO CREEK
LAKE MALONE	826	ROSEWOOD	37-04-19	87-02-20	KY5110003-006L01	MUHLENBERG	GREEN	ROCKY CREEK
LAKE MORRIS	170	KELLY	36-55-44	87-27-18	KY5130205-009L02	CHRISTIAN	LOWER CUMBERLAND	UPPER BRANCH,LITTLE RIVER
LAKE PEWEE	360	MADISONVILLE WEST	37-21-09	87-31-40	KY5140205-008L01	HOPKINS	TRADEWATER	GREASY CREEK
LAKE WASHBURN	26	DUNDEE	37-31-05	86-50-56	KY5110004-007L01	OHIO	GREEN	LICK BRANCH
LAUREL CREEK LAKE	42	WHITLEY CITY	36-41-18	84-26-35	KY5130101-011L01	MCCREARY	UPPER CUMBERLAND	LAUREL CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
LAUREL RIVER LAKE	6060	SAWYER	36-58-21	84-15-31	KY5130101-003	LAUREL\WHITLEY	UPPER CUMBERLAND	LAUREL RIVER
LEWISBURG LAKE	51	LEWISBURG	36-58-14	86-53-36	KY5110003-008L01	LOGAN	GREEN	AUSTIN CREEK
LIBERTY LAKE	79	LIBERTY	37-19-03	84-54-26	KY5110001-042L01	CASEY	GREEN	HICKMAN CREEK
LOCH MARY	135	MADISONVILLE WEST	37-16-06	87-31-22	KY5140205-008L02	HOPKINS	TRADEWATER	UT TO CLEAR CREEK
LONG POND	56	CAIRO,ILL-KY	37-01-15	89-07-40	KY8010100-002L01	BALLARD	MISSISSIPPI	CYPRESS SLOUGH
LONG RUN PARK LAKE	27	CRESTWOOD	38-16-01	85-25-05	KY5140102-012L01	JEFFERSON	SALT	LONG RUN
LUZERNE LAKE	55	GREENVILLE	37-12-42	87-11-54	KY5110003-003L01	MUHLENBERG	GREEN	UT TO CANEY CREEK
MARION COUNTY LAKE	21	LEBANON EAST	37-30-54	85-14-45	KY5140103-007L01	MARION	SALT	UT TO ROLLING FORK
MARTIN'S FORK LAKE	334	ROSE HILL,VA-KY	36-44-36	83-15-58	KY5130101-033L01	HARLAN	UPPER CUMBERLAND	MARTINS FORK
MAUZY LAKE	84	BORDLEY	37-37-08	87-51-26	KY5140202-004L01	UNION	OHIO	CASEY CREEK
MCNEELY LAKE	51	BROOKS	38-06-09	85-38-07	KY5140102-008L01	JEFFERSON	SALT	PENNSYLVANIA RUN
METCALFE COUNTY LAKE	22	EAST FORK	37-02-30	85-36-32	KY5110001-022L01	METCALFE	GREEN	SULPHUR CREEK
METROPOLIS LAKE	36	JOPPA,ILL-KY	37-08-52	88-46-00	KY5140206-006	MCCRACKEN	OHIO	FLOOD PLAIN LAKE
MILL CREEK LAKE (MONROE COUNTY)	109	TOMPKINSVILLE	36-40-44	85-41-45	KY5110002-022L01	MONROE	GREEN	MILL CREEK
MILL CREEK LAKE (POWELL COUNTY)	41	SLADE	37-46-07	83-40-06	KY5100204-018L01	POWELL	KENTUCKY	MILL CREEK
MOFFIT LAKE	49	BORDLEY	37-34-41	87-51-10	KY5140205-002L01	UNION	TRADEWATER	DYSON CREEK
NOLIN RIVER LAKE	5790	NOLIN LAKE	37-20-10	86-10-55	KY5110001-007	EDMONSON	GREEN	NOLIN RIVER
PAINTSVILLE LAKE	1139	OIL SPRINGS	37-50-28	82-52-38	KY5050203-008	JOHNSON	BIG SANDY	LEVISA FORK
PANBOWL LAKE	98	JACKSON,QUICKSAND	37-34-30	82-22-31	KY5100201-005L01	BREATHITT	KENTUCKY	NF KENTUCKY RIVER
PENNYRILE LAKE	47	DAWSON SPRINGS SW	37-04-06	87-39-50	KY5140205-014L02	HOPKINS	TRADEWATER	CLIFTY CREEK
PROVIDENCE CITY LAKE (NEW)	35	PROVIDENCE	37-22-30	87-47-49	KY5140205-007L01	WEBSTER	TRADEWATER	OWENS CREEK
REFORMATORY LAKE	54	LAGRANGE	38-23-52	85-26-16	KY5140101-004L01	OLDHAM	OHIO	CEDAR CREEK
ROUGH RIVER LAKE	5100	MCDANIELS	37-36-40	86-29-00	KY5110004-013	GRAYSON\BRECKINRIDGE	GREEN	ROUGH RIVER
SALEM LAKE	99	HODGENVILLE	37-35-29	85-42-41	KY5110001-016L01	LARUE	GREEN	SALEM CREEK
SANDLICK CREEK LAKE	74	BURTONVILLE	38-23-23	83-36-41	KY5100101-021L01	FLEMING	LICKING	SAND LICK CREEK
SCENIC LAKE	18	EVANSVILLE S,ILL-KY	37-52-42	87-33-37	KY5140202-007	HENDERSON	OHIO	UT TO OHIO RIVER
SHANTY HOLLOW LAKE	135	REEDYVILLE	37-09-02	86-23-13	KY5110001-005L01	WARREN	GREEN	CLAY LICK CREEK
SHELBY LAKE	17	SHELBYVILLE	38-13-59	85-13-02	KY5140102-022L01	SHELBY	SALT RIVER	CLEAR CREEK
SMOKEY VALLEY LAKE	36	GRAHN	38-21-59	83-07-41	KY5090103-007L01	CARTER	TYGARTS CREEK	SMOKEY CREEK

LAKE NAME	TOTAL ACRES	USGS QUADRANGLE	LATITUDE	LONGITUDE	WATERBODY SYSTEM NUMBER	COUNTY NAME	RIVER BASIN	SUBBASIN
SPA LAKE (MUD RIVER MPS 6A)	240	SHARON GROVE	36-56-04	87-01-25	KY5110003-007L01	LOGAN	GREEN	WOLF LICK CREEK
SPURLINGTON LAKE	36	SPURLINGTON	37-23-18	83-15-12	KY5110001-034L01	TAYLOR	GREEN	BRUSHY FK,ROBINSON CREEK
STANFORD CITY RESERVOIR	43	HALLS GAP	37-29-12	84-40-48	KY5100205-044L01	LINCOLN	KENTUCKY	NEALS CREEK
SYMPSON LAKE	184	CRAVENS	37-48-27	85-30-17	KY5140103-011L01	NELSON	SALT	BUFFALO CREEK
SWAN POND	195	BARLOW,KY-ILL	37-15-50	89-07-05	KY8010100-001L04	BALLARD	MISSISSIPPI	MINOR SLOUGH
TAYLORSVILLE LAKE	3050	TAYLORSVILLE	38-00-05	85-13-12	KY5140102-025	SPENCER	SALT	N\A
TURNER LAKE	61	OLMSTEAD,ILL-KY	37-10-22	89-02-30	KY5140206-001L01	BALLARD	OHIO	HUMPHREY CREEK
TYNER LAKE	87	MCKEE	37-22-09	83-54-47	KY5130102-010L01	JACKSON	UPPER CUMBERLAND	FLAT LICK CREEK
WILGREEN LAKE	169	RICHMOND SOUTH	37-42-44	84-20-43	KY5100205-053L01	MADISON	KENTUCKY	TRACE FORK,SILVER CREEK
WILLIAMSTOWN LAKE	300	WILLIAMSTOWN	38-40-38	84-31-15	KY5100101-007L01	GRANT	LICKING	SF GRASSY CREEK
WILLISBURG LAKE	126	BRUSH GROVE	37-49-32	85-09-24	KY5140103-017L01	WASHINGTON	SALT	LICK CREEK
WOOD CREEK LAKE	672	BERNSTADT	37-11-24	84-10-48	KY5130102-005L01	LAUREL	UPPER CUMBERLAND	WOOD CREEK

COLUMN HEADER	DEFINITION
ASSESSMENT:	
DATE	year of the most recent assessment
CAT	CATEGORY = the type of assessment made in determining the water quality condition of the waterbody M (monitored) assessments were based on current (<10 yrs. old) site-specific data E (evaluated) assessments were based on information other than site specific criteria
TYPE	one digit code representing the type of water quality assessment made on the waterbody: 1 = assessment based on growing season sampling regime (three times per year) 2 = assessment based on data collected over time at fixed monitoring stations 3 = assessment based on Division of Water collections 4 = assessment based on U.S.Corps of Engineers collections 5 = assessment based on Tennessee Valley Authority collections
TROPHIC STATUS	the trophic state of the waterbody at the most recent assessment
TOX MONT?	Toxics Monitoring? an indication of the existence of information (Y=yes;N=no) indicating the presence or absence of toxics in the waterbody
TOXIC CODES	the type of toxics monitoring information gathered at the waterbody 1 = Organics in the water column 2 = Organics in fish tissue 3 = Pesticides in water column 4 = Pesticides in fish tissue 5 = Metals in the water column 6 = Metals in the sediment 7 = Metals in fish tissue 8 = Toxics testing of discharges

FISHABLE:

SUFF	the number of acres supporting the water quality conditions that allow a balanced population of fish and wildlife
PART	the number of acres partially supporting the water quality conditions that allow a balanced population of fish and wildlife
NOT	the number of acres that are not supporting the water quality conditions that allow balanced population of fish and wildlife

SWIMMABLE:

SUFF	the number of acres which support water-based recreational activities
PART	the number of acres which partially support water-based recreational activities
NOT	the number of acres which do not support water-based recreational activities

USE SUPPORT: Use Support Status

FULL	all uses are supported(based on data)
PART	one or more uses are partially supported and the remaining uses are fully supported
NOT	one or more uses are not being supported

1) WAH = warmwater aquatic habitat
2) CAH = coldwater aquatic habitat
3) PCR = primary contact recreation
4) SCR = secondary contact recreation
5) DWS = domestic water supply

CAUSE\SOURCE: a code which refers to the cause and source of the impact that caused the waterbody to either not or partially support the use

1 = metals	A = natural
2 = nutrients	B = lake fertilization
3 = suspended solids	C = municipal (package treatment plants)
4 = shallow lake basin	D = septic tanks
5 = pH	E = unspecified nonpoint source
6 = other inorganics	F = surface mining/deep mining/abandoned lands

LAKE NAME	ASSESSMENT DATE	CAT	TYPE	TROPHIC STATUS	TOX MON?	TOXIC CODES	FISHABLE: S	PS	NS	SWIMMABLE: S	PS	NS	USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/SOURCE
A.J.JOLLY LAKE	1989	M	1,3	EUTROPHIC	N		204			204			WAH,PCR,SCR,DWS			
ARROWHEAD LAKE	1989	M	1,3	EUTROPHIC	N		37			37			WAH,PCR,SCR			
BARREN RIVER LAKE	1987	M	2,4	MESOTROPHIC	N		10000			10000			WAH,PCR,SCR.DWS			
BEAVER CREEK ARM	1987	M	2,4	EUTROPHIC	N								WAH,PCR,SCR			
SKAGGS CREEK ARM	1987	M	2,4	MESOTROPHIC	N								WAH,PCR,SCR			
BEAVER LAKE	1989	M	1,3	EUTROPHIC	N		158			158			WAH,PCR,SCR			
BERT COMBS LAKE	1983	M	1,3	MESOTROPHIC	N		36			36			WAH,PCR,SCR,DWS			
BOLTZ LAKE	1989	M	1,3	EUTROPHIC	N		92			92			WAH,PCR,SCR			
BRIGGS LAKE	1983	M	1,3	EUTROPHIC	N		18			18			WAH,PCR	SCR		2,B
BUCK LAKE	1989	M	1,3	EUTROPHIC	N		19			19			WAH,PCR,SCR			
BUCKHORN LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	1230			1230			WAH,PCR,DWS	SCR		3,F
BULLOCK PEN LAKE	1989	M	1,3	EUTROPHIC	N		134			134			WAH,PCR,SCR,DWS			
BURNT POND	1989	M	1,3	EUTROPHIC	N		10			10			WAH,PCR,SCR			
CAMPBELLSVILLE CITY RESERVOIR	1989	M	1,3	EUTROPHIC	N		63			63			PCR,SCR,DWS	WAH		2,G
CAMPTON LAKE	1982	M	1,3	OLIGOTROPHIC	N		26			26			WAH,PCR,SCR,DWS			
CANEYVILLE CITY RESERVOIR	1983	M	1,3	MESOTROPHIC	N		75			75			WAH,PCR,SCR	DWS		2,A
CANNON CREEK LAKE	1982	M	1,3	OLIGOTROPHIC	N		243			243			WAH,PCR,SCR,DWS			
CARPENTER LAKE	1981	M	1,3	EUTROPHIC	N		64			64			WAH,PCR	SCR		4,A
CARR FORK LAKE	1989	M	2,4	EUTROPHIC	Y	1,3,5,6	710			710			WAH,PCR	SCR		3,F
CAVE RUN LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	8270			8270			WAH,PCR SCR,DWS			
CHENOA LAKE	1982	M	1,3	EUTROPHIC	N		37			37			WAH,PCR,SCR			
CORBIN CITY RESERVOIR	1992	M	1,3	EUTROPHIC	N		139			139			WAH,PCR,		DWS,SCR	2,C,G
CORINTH LAKE	1989	M	1,3	EUTROPHIC	N		96			96			WAH,PCR,SCR			
CRANKS CREEK LAKE	1982	M	1,3	OLIGOTROPHIC	N			219			219		PCR,SCR	WAH		5,F
DALE HOLLOW LAKE	1979	M	2,4	OLIGOTROPHIC	N		4300			4300			WAH,PCR,SCR			
DEWEY LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	1100			1100			WAH,PCR	SCR		3,F
DOE RUN LAKE	1989	M	1,3	EUTROPHIC	N		51			51			WAH,PCR,SCR			
ELMER DAVIS LAKE	1989	M	1,3	EUTROPHIC	N		149			149			WAH,PCR,SCR			
ENERGY LAKE	1989	M	1,3	EUTROPHIC	N		370			370			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT DATE	CAT	TYPE	TROPHIC STATUS	TOX MON?	TOXIC CODES	FISHABLE: S	PS	NS	SWIMMABLE: S	PS	NS	USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
FISH LAKE	1989	M	1,3	EUTROPHIC	N		27			227			WAH,PCR,SCR			
FISHPOND LAKE	1982	M	1,3	MESOTROPHIC	N		32			32			WAH,PCR,SCR			
FISHTRAP LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1143			1143			WAH,PCR	SCR		3,F
FLAT LAKE	1989	M	1,3	EUTROPHIC	N		38			38			WAH,PCR,SCR			
FREEMAN LAKE	1981	M	1,3	MESOTROPHIC	N		160			160			WAH,PCR,SCR,DWS			
GENERAL BUTLER ST.PK. LAKE	1989	M	1,3	EUTROPHIC	N		29			29			WAH,PCR,SCR			
GRAPEVINE LAKE	1981	M	1,3	EUTROPHIC	N		50			50			WAH,PCR,SCR,DWS			
GRAYSON LAKE	1989	M	2,4	OLIGOTROPHIC	Y	1,3,5,6	1512			1512			WAH,PCR,SCR,DWS			
GREENBRIAR LAKE	1982	M	1,3	EUTROPHIC	N		66			66			WAH,PCR,SCR,DWS			
GREENBO LAKE	1989	M	1,3	MESOTROPHIC	N		181			181			WAH,PCR,SCR			
GREEN RIVER LAKE	1989	M	2,4	EUTROPHIC	Y	1,2,3,5,6	8210			8210			WAH,PCR,SCR,DWS			
GUIST CREEK LAKE	1989	M	1,3	EUTROPHIC	N		317			317			PCR,SCR	WAH,DWS		2,6
HEMATITE LAKE	1989	M	1,3	MESOTROPHIC	N		90			90			WAH,PCR,SCR			
HERRINGTON LAKE	1989	M	1,3	EUTROPHIC	N		2940			2940			PCR,SCR,DWS	WAH		2,C,G,
HONKER LAKE	1989	M	1,3	MESOTROPHIC	N		190			190			PCR,SCR	WAH		2,A
KENTUCKY LAKE	1982	M	2,4	EUTROPHIC	Y	1,2,3,4,5,6,7	48100			48100			WAH,PCR,SCR,DWS			
KINCAID LAKE	1982	M	1,3	EUTROPHIC	N		183			183			PCR,SCR	WAH		2,B
KINGFISHER LAKE	1983	M	1,3	EUTROPHIC	N		30			30			WAH,PCR	SCR		2,B
LAKE BARKLEY	1984	M	5	EUTROPHIC	N		45600			45600			WAH,PCR,SCR,DWS			
LAKE BESHEAR	1981	M	1,3	MESOTROPHIC	N		760			760			WAH,PCR,SCR,DWS			
LAKE BLYTHE	1983	M	1,3	MESOTROPHIC	N		89			89			WAH,PCR,SCR			
LAKE CARNICO	1983	M	1,3	EUTROPHIC	N		114			114			WAH,PCR,SCR			
LAKE CUMBERLAND	1982	M	2,4	OLIGOTROPHIC	N		50250			50250			WAH,PCR,SCR,DWS			
LILY CREEK ARM	1989	M	1,3	EUTROPHIC	N								WAH,PCR,SCR			
BEAVER CREEK ARM	1989	M	1,3	EUTROPHIC	N								WAH,PCR,SCR			
LAKE GEORGE	1981	M	1,3	MESOTROPHIC	N		53			53			WAH,PCR,SCR,DWS			
LAKE JERICHO	1989	M	1,3	EUTROPHIC	N			137		137			PCR,SCR		WAH	2,6
LAKE LINVILLE	1982	M	1,3	EUTROPHIC	N		273			273			WAH,PCR,SCR,DWS			
LAKE MALONE	1981	M	1,3	EUTROPHIC	N		826			826			WAH,PCR,SCR			

LAKE NAME	ASSESSMENT DATE	CAT	TYPE	TROPHIC STATUS	TOX MON?	TOXIC CODES	FISHABLE: S	PS	NS	SWIMMABLE: S	PS	NS	USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
LAKE MORRIS	1983	M	1,3	EUTROPHIC	N		170			170			WAH,PCR,SCR	DWS		2,G
LAKE PEWEE	1981	M	1,3	MESOTROPHIC	N		360			360			WAH,PCR,SCR,DWS			
LAKE WASHBURN	1983	M	1,3	EUTROPHIC	N		26			26			WAH,PCR,SCR			
LAUREL CREEK LAKE	1983	M	1,3	MESOTROPHIC	N		42			42			WAH,PCR,SCR	DWS		2,A
LAUREL RIVER LAKE	1979	M	2,4	OLIGOTROPHIC	N		6060			6060			WAH,PCR SCR,DWS			2,C,E
MIDLAKE-LAUREL RIVER ARM	1979	M	2,4	MESOTROPHIC	N								WAH,PCR,SCR,DWS			
HEADWATERS-LAUREL RIVER ARM	1979	M	2,4	EUTROPHIC	N								WAH,PCR	SCR		2,C,G
LEWISBURG LAKE	1981	M	1,3	MESOTROPHIC	N		51			51			WAH,PCR,DWS	SCR		4,A
LIBERTY LAKE	1989	M	1,3	MESOTROPHIC	N		79			79			WAH,PCR,SCR	DWS		1,A
LOCH MARY	1981	M	1,3	MESOTROPHIC	N		135			135			WAH,PCR,SCR		DWS	1,5,F
LONG POND	1989	M	1,3	EUTROPHIC	N		56			56			WAH,PCR,SCR			
LONG RUN PARK LAKE	1989	M	1,3	MESOTROPHIC	N		27			27			WAH,PCR,SCR			
LUZERNE LAKE	1981	M	1,3	MESOTROPHIC	N		55			55			WAH,PCR,SCR,DWS			
MARION COUNTY LAKE	1989	M	1,3	EUTROPHIC	N		21			21			WAH,PCR	SCR		2,B
MARTIN'S FORK LAKE	1982	M	2,4	OLIGOTROPHIC	N		334			334			WAH,PCR	SCR		3,F
MAUZY LAKE	1981	M	1,3	EUTROPHIC	N		84			84			WAH,PCR,SCR			
MCNEELY LAKE	1989	M	1,3	EUTROPHIC	N			51		51			PCR,SCR		WAH	2,C
METCALFE COUNTY LAKE	1983	M	1,3	MESOTROPHIC	N		22			22			WAH,PCR	SCR		4,A
METROPOLIS LAKE	1989	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
MILL CREEK LAKE (MONROE COUNTY)	1983	M	1,3	EUTROPHIC	N		109			109			WAH,PCR,SCR			
MILL CREEK LAKE (POWELL COUNTY)	1982	M	1,3	MESOTROPHIC	N		41			41			WAH,PCR,SCR,DWS			
MOFFIT LAKE	1983	M	1,3	EUTROPHIC	N		49			49			WAH,PCR,SCR			
NOLIN RIVER LAKE	1989	M	2,4	EUTROPHIC	Y	1,3,5,6	5790			5790			WAH,PCR,SCR			
PAINTSVILLE LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	1139			1139			WAH,PCR,SCR			
PANBOWL LAKE	1982	M	1,3	MESOTROPHIC	N		98			95			WAH,PCR,SCR			
PENNYRILE LAKE	1983	M	1,3	MESOTROPHIC	N		47			47			WAH,PCR,SCR			
PROVIDENCE CITY LAKE (NEW)	1983	M	1,3	OLIGOTROPHIC	N		35			35			WAH,PCR,SCR,DWS			
REFORMATORY LAKE	1989	M	1,3	HYPER-EUTROPHIC	N			54		54			PCR,SCR		WAH	2,H
ROUGH RIVER LAKE	1989	M	2,4	MESOTROPHIC	Y	1,3,5,6	5100			5100			WAH,PCR,SCR	DWS		1,A

LAKE NAME	ASSESSMENT DATE	CAT	TYPE	TROPHIC STATUS	TOX MON?	TOXIC CODES	FISHABLE: S	PS	NS	SWIMMABLE: S	PS	NS	USE FULLY SUPPORTED	USE PART SUPPORTED	USE NOT SUPPORTED	CAUSE/ SOURCE
SALEM LAKE	1982	M	1,3	MESOTROPHIC	N		99			99			WAH,PCR,DWS	SCR		4,A
SANDLICK CREEK LAKE	1989	M	1,3	EUTROPHIC	N		74			74			PCR,SCR	WAH		2,G
SCENIC LAKE	1993	M	1,3	EUTROPHIC	N		18			19			WAH,PCR,SCR			
SHANTY HOLLOW LAKE	1981	M	1,3	EUTROPHIC	N		135			135			WAH,PCR,SCR			
SHELBY LAKE	1983	M	1,3	EUTROPHIC	N		17			17			PCR,SCR	WAH		2,G
SMOKEY VALLEY LAKE	1989	M	1,3	MESOTROPHIC	N		36			36			WAH,PCR,SCR			
SFA LAKE (MUD RIVER MPS 6A)	1981	M	1,3	EUTROPHIC	N		240			240			PCR,SCR,DWS	WAH		2,G
SPURLINGTON LAKE	1989	M	1,3	EUTROPHIC	N		36			36			WAH,PCR,SCR			
STANFORD CITY RESERVOIR	1989	M	1,3	OLIGOTROPHIC	N		43			43			WAH,PCR,SCR	DWS		2,A
SYMPSON LAKE	1981	M	1,3	MESOTROPHIC	N		184			184			WAH,PCR,SCR		DWS	2,G
SWAN POND	1989	M	1,3	EUTROPHIC	N		193			193			WAH,PCR,SCR			
TAYLORSVILLE LAKE	1989	M	2,4	EUTROPHIC	Y	1,3,5,6		3050		3050			PCR,SCR		WAH	2,C,E
TURNER LAKE	1989	M	1,3	EUTROPHIC	N		61			61			WAH,PCR,SCR			
TYNER LAKE	1982	M	1,3	OLIGOTROPHIC	N		87			87			WAH,PCR,SCR,DWS			
WILGREEN LAKE	1982	M	1,3	EUTROPHIC	N		169			169			PCR	WAH,SCR		2,D
WILLIAMSTOWN LAKE	1981	M	1,3	EUTROPHIC	N		300			300			PCR,SCR,DWS	WAH		2,G
WILLISBURG LAKE	1989	M	1,3	EUTROPHIC	N		126			126			WAH,PCR,SCR,DWS			
WOOD CREEK LAKE	1989	M	1,3	MESOTROPHIC	N		672			672			WAH,PCR,SCR,DWS			

APPENDIX D

NONPOINT SOURCE IMPACTED WATERBODIES

Appendix D
Nonpoint Source Impacted Waterbodies

Big Sandy River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
	BIG SANDY RIVER BASIN									
KY05070201-001	TUG FORK	50	51	52	55	40	SED, BACT, SO4	NPS SURVEY, 1987; DOW-BIO, 1987	MONITORED	WAH
KY05070201-002	ROCKCASTLE CREEK	51	52	55	32	60	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-003	WOLF CREEK	51	21	52	32	65	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-004	TUG FORK	10	51	52	55	40	BACT, SED, SO4	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05070201-004	EMILY CREEK	51	65	21	52	32	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-004	TURKEY CREEK	51	62	32	14	80	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-005	BIG CREEK	10	50	51	52	65	SED, BACT, SO4	NPS, 1987; DOW, 1988; DFWR, 1986	MONITORED	WAH
KY05070201-006	POND CREEK	51	52	65	80	32	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-007	TUG FORK	10	51	52	55	40	BACT, SED, SO4	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05070201-008	BLACKBERRY CREEK	51	52	65	80	32	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-009	PETER CREEK	51	52	65	80	32	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070201-010	KNOX CREEK	10	51	52	65	80	BACT, SED, SO4	NPS SURVEY, 1987; DOW-BACT, 1988	MONITORED	PCR
KY05070202-001	LEVISA FORK	51	52	40	65	80	SED, BACT, SO4, MET	NPS SURVEY, 1987; DOW-BACT, 1988	MONITORED	
KY05070202-002	SHELBY CREEK	51	52	65	60	32	SO4, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070202-004	RUSSELL FORK	10	65				BACT	DOW-BACT, 1988	MONITORED	PCR
KY05070202-005	ELKHORN CREEK	80	51	52	21	65	SED, BACT, SO4	NPS SURVEY, 1987	EVALUATED	
KY05070202-009	GRAPEVINE CREEK	52	65	80	32	83	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070202-010	FEDS CREEK	51	52	65	80	32	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-001	LEVISA FORK	10	50	83	51	55	SED, BACT, SO4, MET, NUTR	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	WAH
KY05070203-002	GEORGES CREEK	51	83	32	65	21	MET, SED, SO4, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-003	TOMS CREEK	51	52	61	65	62	SED, BACT, SO4, MET, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05070203-004	GREASY CREEK	51	21	83	65	20	SED, BACT, SO4, MET, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05070203-004	WILEY CREEK	51	21	65	80		SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-004	GRIFFITH CREEK	51	32	65	80	83	MET, SED, SO4, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-005	BARNETTS CREEK	32	83	65	20	80	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-005	PAINT CREEK	40					BACT	DOW-BACT, 1988	MONITORED	PCR
KY05070203-006	JENNYS CREEK	51	55	83	80	32	SED, Cl, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-007	MUDLICK CREEK	51	52	83	80	31	SED, Cl, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-009	LITTLE PAINT CREEK	80	65	32			SO4, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-010	LEVISA FORK	10	50				SED	DOW-AMB, 1988-89	MONITORED	WAH

Big Sandy River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
KY05070203-011	JOHNS CREEK	51	80	65	32	52	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-011	DANIEL CREEK	83	51	75	71	52	BACT, SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05070203-013	BRUSHY CREEK	51	52	65	80	32	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-013	RACCOON CREEK	51	52	65	80	61	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-013	BUFFALO CREEK	51	80	45	32	33	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-014	LF. FORK MIDDLE CREEK	51	65	60	32		SED, SO4, BACT, MET	NPS, 1987; DFWR, 1987, DOW, 1988	EVALUATED	WAH, PCR
KY05070203-014	RT. FORK MIDDLE CREEK	80	65	32			SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-015	ABBOTT CREEK	80	65	32			SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-015	MILLER CREEK	63	51	52	65	62	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-016	LEVISA FORK	10	40	70			BACT, ORGANICS, DO, TSS, SED	DOW-AMB/BIO, 1988-89	MONITORED	PCR, WAH
KY05070203-017	BULL CREEK	51	57	80	65	32	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070203-017	COW CREEK	80	65	32	51		SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05070203-018	BEAVER CREEK	51	65	40	80	32	pH, Fe, SO4, SP. COND.	NPS SURVEY, 1987; USGS, 1980	EVALUATED	
KY05070203-019	CANEY FORK	51	31	80	65	32	SED, SO4, MET, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070203-020	LF. FORK BEAVER CREEK	50	40	65	80	32	pH, NUTR, BACT, SED	NPS SURVEY, 1987	EVALUATED	
KY05070203-021	LEVISA FORK	10	40	70			BACT, ORGANICS, DO, TSS, SED	DOW-AMB/BIO, 1988-89	MONITORED	PCR, WAH
KY05070203-022	MUD CREEK	51	65	80	32	10	SED,ORGANICS,DO,BACT,SO4,MET	NPS, 1987; DFWR, 1987; DOW, 1988	MONITORED	WAH
KY05070203-023	ISLAND CREEK	51	52	65	80	61	SO4, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05070204-001	BIG SANDY RIVER	50					MET	ORSANCO, 1988-89	MONITORED	WAH
KY05070204-002	FIVE FORKS CREEK	51	84	52	31	73	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070204-005	BLAINE CREEK	55	51	31	32	21	Cl,TDS,SED,BACT,SO4,MET	NPS, 1987; ACOE, 1985; EPA, 1986	MONITORED	WAH
KY05070204-006	BLAINE CREEK	55	51	31	32	21	Cl,TDS,SED,BACT,SO4,MET	NPS, 1987; ACOE, 1985; EPA, 1986	MONITORED	WAH
KY05070204-006	UPPER LAUREL CREEK	55	51	61	83	14	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070204-006	LOWER LAUREL CREEK	55	51	61	83	14	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070204-006	HOOD CREEK	55	51	11	83	80	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05070204-006	FRANKS CREEK	55	51	61	80	83	SED, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
	LITTLE SANDY RIVER BASIN									
KY05090104-001	LITTLE SANDY RIVER	10	60				BACT	DOW-AMB/BIO, 1988-89	MONITORED	PCR
KY05090104-002	RACCOON & ALLCORN CREEK	65	11	18	80		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090104-003	E. FORK LITTLE SANDY RIVER	10	50	80	65	11	SED,NUTR,BACT,SO4,MET,Cl	NPS SURVEY, 1987; DOW-IS, 1987	MONITORED	WAH
KY05090104-004	LITTLE SANDY RIVER	10	60	65	11	18	BACT, SED, NUTR	NPS, 1987; DOW-AMB/BIO, 1988-89	MONITORED	PCR

Big Sandy River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY05090104-005	LITTLE FORK	51	80	65	21	70	SED, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05090104-007	BARNETT CREEK	65	18	80			BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090104-007	STINSON CREEK	65	80	20	31		BACT, SED	NPS SURVEY, 1987	EVALUATED	
KY05090104-007	LOST CREEK	80	21	65	11	18	SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090104-007	OLDTOWN CREEK	65	11	18	90		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090104-007	CANE CREEK	65	11	18	60		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090104-009	NEWCOMBE CREEK	55	51	80	65	50	Cl, TDS, SED, BACT, SO4, MET	NPS SURVEY, 1987; DOW-IS, 1987	MONITORED	WAH
KY05090104-009	BIG GIMLET CREEK	11	80	65	21		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090104-010	LITTLE SANDY RIVER	10	65	51	55	80	BACT, SED, MET, SO4	NPS, 1987; DOW-AMB/BIO, 1988-89	MONITORED	PCR
KY05090104-010	RT. & MID. FK. LITTLE SANDY R.	51	65	80	21		SED, BACT, MET, SO4	NPS SURVEY, 1987	EVALUATED	
	TYGARTS CREEK BASIN									
KY05090103-001	TYGARTS CREEK	10					BACT	DOW-AMB/BIO, 1988-89	MONITORED	PCR
KY05090103-002	SCHULTZ CREEK	65	11	18	80		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-003	WHITE OAK CREEK	65	11	18	80		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-004	THREE PRONG BRANCH	65	11	18	80		BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090103-004	LEATHERWOOD BRANCH	65	11	18	80		SED	NPS SURVEY, 1987	EVALUATED	
KY05090103-004	WHITE OAK CREEK	65	11	18	30		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-004	BEECHY CREEK	65	11	18	80		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-005	BUFFALO & GRASSY CREEKS	14	20	65			SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-006	TYGARTS CREEK	14	20	65			SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-007	SMOKEY CREEK	14	20	65			SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090103-008	UPPER TYGARTS & FLAT CREEK	80	65	21	18	20	SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
	LAKES									
KY05070202-008	FISHTRAP LAKE	50					SED	305(b), 1988; ACOE/DOW, 1988-89	MONITORED	SCR
KY05070203-012	DEWEY LAKE	51	80	65	31	32	SED, BACT	305(b), 1988; ACOE/DOW, 1988-89	MONITORED	SCR

Licking River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	LICKING RIVER BASIN									
KY05100101-002	BANKLICK CREEK	30	40	10	60		NUTR, MET, SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-003	DECOURSEY CREEK	40	30	60	10		NUTR, MET, SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-004	LICKING RIVER	11	80	14	20		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-005	CRUISES CREEK	10	60	20			NUTR, MET, SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-006	PHILLIPS CREEK	60	30	10	40		NUTR, MET, SED, BACT	NPS SURVEY, 1987; 305(b), 1988	MONITORED	
KY05100101-007	GRASSY CREEK	11	10	65	20	63	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-007	S. FORK GRASSY CREEK	10	18				NUTR, BACT	305(b), 1988	MONITORED	
KY05100101-008	KINCAID CREEK	11	65	20	14	15	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-009	BOWMAN CREEK	10	30	60			NUTR, MET, SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-010	LICKING RIVER	11	14	16	80	20	SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-012	N. FORK LICKING RIVER	10					BACT	DOW-BIO, 1986; DOW-AMB, 1988-89	MONITORED	PCR
KY05100101-013	STONE LICK BRANCH	11	13	14	16	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-014	N. FORK LICKING RIVER	10					BACT	DOW-BIO, 1986; DOW-AMB, 1988-89	MONITORED	PCR
KY05100101-015	LICKING RIVER	80	21	11	65		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-017	JOHNSON CREEK	11	16	13	14	20	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-018	FLEMING CREEK	40	16	11	80		BACT, SED, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY05100101-019	FLAT CREEK	11	80	18	14	65	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-020	HILLSBORO BRANCH	11	16				BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-021	FOX CREEK	21	80	11	73	66	SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-022	SLATE CREEK	16	11	18	14	65	SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-023	SALT LICK CREEK	11	80	21			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-024	TRIPLETT CREEK	10	65	80	40	51	PEST, BACT, SED	NPS SURVEY, 1987; 305(b), 1988	MONITORED	
KY05100101-025	N. FORK TRIPLETT CREEK	65	80	20	14		BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-027	LICKING RIVER	80	21	11	65		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-029	BEAVER CREEK	11	80	40	21		NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100101-030	CRANEY CREEK	80	55	11	65	21	NUTR, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100101-030	N. FORK LICKING RIVER	80	65	51			SED, MET, BACT	NPS SURVEY, 1987; DOW, 1988	EVALUATED	
KY05100101-031	BLACKWATER CREEK	11	80	65			SED	NPS SURVEY, 1987; 305(b), 1988	EVALUATED	
KY05100101-032	GRASSY CREEK	80	65	11			SED, NUTR	NPS SURVEY, 1987	EVALUATED	

Licking River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY05100101-034	LICKING RIVER	51	55	65	80	11	BACT,CI,MET,SP COND,SED,OIL-GREASE	NPS SURVEY, 1987; DOW, 1988	MONITORED	
KY05100101-035	CANEY CREEK	80	65				BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-036	ELK FORK	80	65	21	51		SED, MET, SO4, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-036	WILLIAMS BRANCH	80	51	65	21		SED, MET, SO4, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-037	L.& R. FK. MIDDLE CREEK	51	80	21	32		SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-037	COW CREEK	80					SED	NPS SURVEY, 1987	EVALUATED	
KY05100101-037	LICK CREEK	55	80	32	11		CI, TDS, SED	NPS SURVEY, 1987; DOW-IS, 1986	MONITORED	WAH
KY05100101-037	WHITE OAK CREEK	51	80	32	11		SED, MET, SO4, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100101-037	RACCOON CREEK	55					CI, TDS	DOW-IS, 1986	MONITORED	WAH
KY05100101-037	ROCKHOUSE FORK	55					CI, TDS	DOW-IS, 1986	MONITORED	WAH
KY05100101-038	BURNING FORK	55					CI, TDS	DOW-IS, 1986	MONITORED	WAH
KY05100101-038	SLATE ROAD FORK	55					CI, TDS	DOW-IS, 1986	MONITORED	WAH
KY05100101-039	LICKING RIVER	55	50	51	80	11	CI,TDS,SP COND,ORGANICS,DO,SED,BACT	NPS SURVEY,1987; DOW-AMB/BIO,1988-89	MONITORED	DWS, WAH
KY05100102-001	S. FORK LICKING RIVER	11	12	14	18	10	NUTR, PEST, SED, MET, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100102-002	COOPERSTOWN CREEK	80	10	65			NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100102-005	TWIN CREEK	11	14	20	32	16	SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100102-006	MILL CREEK	11	14	20	32	80	SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100102-008	S. FORK LICKING RIVER	10	40	11	12	14	BACT, NUTR, SED, PEST, MET	NPS,1987; DOW-BIO,1986; DOW-AMB,1988-89	MONITORED	PCR, WAH
KY05100102-010	S. FORK LICKING RIVER	10	40	11	12	14	BACT, NUTR, SED, PEST, MET	NPS,1987; DOW-BIO,1986; DOW-AMB,1988-89	MONITORED	PCR, WAH
KY05100102-012	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100102-013	HOUSTON CREEK	10					BACT	DOW-BACT,1987	MONITORED	PCR
KY05100102-015	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	
KY05100102-016	KENNEDY CREEK	11	16	14	51	18	MET, NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100102-017	STRODES CREEK	10	40	11	14	16	BACT, SED, PEST	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100102-017	HANCOCK CREEK	10					BACT	DOW-BACT, 1987	MONITORED	PCR
KY05100102-018	CABIN CREEK	11	16	14	51	18	MET, NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100102-018	STONER CREEK	10	11	16	14	51	BACT, MET, NUTR, SED	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	
KY05100102-019	HINKSTON CREEK	10	80	11	12	40	BACT, NUTR, SED, MET	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100102-020	BIG BRUSHY CREEK	10	11	62	80	32	NUTR, SED, BACT	NPS SURVEY, 1987; DOW-IS, 1986	MONITORED	WAH
KY05100102-022	SOMERSET CREEK	11	80	19	40	14	BACT, NUTR, SED, MET	NPS SURVEY, 1987	EVALUATED	

Licking River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	LAKES									
KY05100101-007L01	WILLIAMSTOWN LAKE	10					NUTR	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	WAH
KY05100101-021L01	SAND LICK CREEK LAKE	10					NUTR	DOW-LAKES, 1988-89	MONITORED	WAH
	OHIO RIVER									
	MINOR TRIBUTARIES									
KY05090201-001	TWELVE MILE CREEK	10	30	60			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-002	LOCUST CREEK	11	14	15	21	22	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-003	BRACKEN CREEK	11	14	15	21	22	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-004	LEE CREEK	11	12	13	14	16	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-005	LAWRENCE CREEK	11	13	14	15	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-006	EAST FORK CABIN CREEK	11	65	13	14	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-006	CABIN CREEK	65	20	80	18	11	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-008	QUICKS RUN	14	21				SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05090201-009	SALT LICK CREEK	23	21	20	65	11	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-010	KINNICONNICK CREEK	23	21	80	65	18	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	BULL FORK CREEK	65	55	11	14	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	BEASLEY CREEK	11	12	13	14	16	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	INDIAN CREEK	11	14	13	12	15	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	TURTLE CREEK	11	14	15	21	22	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	SNAG CREEK	11	14	15	21	22	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090201-014	FOUR MILE CREEK	60	10	30	40		SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
	KENTUCKY RIVER BASIN									
KY05100201-002	N. FORK KENTUCKY RIVER	40	80	51	55	21	BACT, SED, SO4, MET	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05100201-003	DEVIL CREEK	50	51	55	20		SED, MET, SO4, Cl, pH, Fe	NPS SURVEY, 1987; DOW, 1981	EVALUATED	
KY05100201-003	WALKERS CREEK	55	21	23			SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100201-004	FROZEN CREEK	80	11				SED	NPS SURVEY, 1987	EVALUATED	
KY05100201-004	BOONE FK. FROZEN CREEK	80	11				SED	NPS SURVEY, 1987	EVALUATED	
KY05100201-005	N. FORK KENTUCKY RIVER	40	10	50	80	51	BACT, SED, SO4, MET	NPS,1987; DOW-BIO,1986;DOW-AMB,1988-89	MONITORED	PCR, WAH
KY05100201-006	CANEY CREEK	80					SED	NPS SURVEY, 1987	EVALUATED	
KY05100201-007	S. FK. QUICKSAND CREEK	10	51	80			BACT, SED	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100201-007	SPRING FORK	50					SED	DFWR, 1987	EVALUATED	WAH
KY05100201-007	QUICKSAND CREEK	10	51	55	65	80	BACT, NUTR, SO4, SED, Cl	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100201-008	N. FORK KENTUCKY RIVER	80	51	55	20		SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-009	TROUBLESOME CREEK	60	40	51	52	55	BACT, SO4, MET, SED	NPS SURVEY, 1987; DOW-BACT, 1987	MONITORED	PCR
KY05100201-009	BUCKHORN CREEK	51	65				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100201-009	LOST CREEK	50	80				SED, NUTR, BACT	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05100201-009	BALLS FORK	65	80	51	32		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100201-010	N. FORK KENTUCKY RIVER	51	52	80	55	21	SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-011	BIG CREEK	51	52	55	32	23	SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-011	GRAPEVINE CREEK	51	52	80	32		SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-012	N. FORK KENTUCKY RIVER	51	52	80	55	32	SED, MET, AS, Cl, SO4	NPS,1987; DFWR, 1987; 305(b), 1983	EVALUATED	
KY05100201-013	LOTTS CREEK	51	52	65	80	32	SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-016	CARR FORK CREEK	51	52	60	57		SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100201-017	N. FORK KENTUCKY RIVER	51	80	11	52	32	SED, AS, MET, Cl	NPS, 1987; DFWR, 1987; 305(b), 1988	EVALUATED	
KY05100201-018	LEATHERWOOD CREEK	51	52	80	57	55	SO4, SED, MET, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100201-019	TURKEY CREEK	51	80	21	55		SO4, SED, MET, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100201-020	MACES CREEK	51	52	55	23	80	SO4, SED, MET, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100201-021	ROCKHOUSE CREEK	50	51	57	80	21	SED, MET, SO4	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05100201-022	MILLSTONE CREEK	51	80	63	21		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100202-001	N. FORK KENTUCKY RIVER	10	51	11	52	80	BACT, SED, MET, SO4, Cl	NPS SURVEY, 1987; DOW-BIO/AMB, 1988-89	MONITORED	PCR, WAH-THREATENED
KY05100202-002	TURKEY CREEK	11					SED, Cl, MET	NPS SURVEY, 1987	EVALUATED	

Kentucky River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
KY05100202-002	LONG CREEK	51	52	80	23	21	SED	NPS SURVEY, 1987	EVALUATED	
KY05100202-006	CUTSHIN CREEK	50	51	80	55	52	OIL-GREASE, SED, MET, SO4, Cl	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05100202-005	RACCOON CREEK	50					OIL-GREASE, SED	DFWR, 1987	EVALUATED	WAH
KY05100202-007	M. FORK KENTUCKY RIVER	51	57	52	21	80	SED, MET, SO4, Cl, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100202-008	ROCKHOUSE CREEK	32	80	21	55	51	SED, MET, SO4, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100202-009	GREASY CREEK	51	52	80	14	32	SED, MET, SO4, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100202-010	M. FORK KENTUCKY RIVER	51	57	52	21	80	SED, MET, SO4, Cl, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100202-010	BEECH FORK	51	52	80	55	32	SED, MET, SO4, Cl	NPS SURVEY, 1987	EVALUATED	
KY05100203-001	S. FORK KENTUCKY RIVER	50	20	51	80	11	SED, BACT, Cl	NPS SURVEY, 1987; DOW-BIO, 1986	MONITORED	WAH-THREATENED
KY05100203-002	SEXTON CREEK	57	51	85	11	20	SED, MET, SO4, Cl, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100203-003	UPPER BUFFALO CREEK	51					SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100203-004	BULLSKIN CREEK	20	51	52	80	55	SED, MET, SO4, Cl, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	COW CREEK	51	11				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	INDIAN CREEK	51	11				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	ISLAND CREEK	51	11				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	BUCK CREEK	80	51	11			SED	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	JONES FORK	80	65	51	32		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	R. FORK BEAVER CREEK	51	65	80	32		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100203-005	MEADOW CREEK	80	32				SED	NPS SURVEY, 1987	EVALUATED	
KY05100203-006	GOOSE CREEK	51	20	14	11	77	SED, MET, SO4, Cl, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100203-010	GOOSE CREEK	51	20	14	11	77	SED, MET, SO4, Cl, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100203-011	REDBIRD RIVER	20	51	14	11	62	SO4, SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100204-001	KENTUCKY RIVER	11	22	55	80	51	Cl, SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100204-001	CAMPBELL CREEK	22	55	80			SED, Cl	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100204-002	DROWNING CREEK	11	65	32	14	22	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100204-004	RED LICK CREEK	11	65	22	55	80	Cl, SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100204-006	S FK STATION CAMP CREEK	55	18	85	80	22	Cl, SED, MET, NUTR, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100204-008	KENTUCKY RIVER	11	22	55	80	51	SED, MET, NUTR, CL, SO4, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100204-008	COW CREEK	55	80				Cl, SED	NPS SURVEY, 1987	EVALUATED	
KY05100204-009	BIG SINKING CREEK	50					Cl, TDS	DOW-IS, 1989	MONITORED	WAH
KY05100204-009	BILLEY FORK	50					Cl, TDS	DOW-IS, 1989	MONITORED	WAH
KY05100204-009	MILLERS CREEK	50	55	22	11	90	Cl, TDS, SED, MET, NUTR, SO4	NPS, 1987; 305(b), 1988; DOW-IS, 1989	MONITORED	WAH

Kentucky River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY05100204-010	KENTUCKY RIVER	10	51	11	80	22	BACT, SED, MET, NUTR, SO4, Cl	NPS SURVEY, 1987; DOW-BIO/AMB, 1988-89	MONITORED	PCR, WAH-THREATENED
KY05100204-011	STURGEON CREEK	57	85	80	51		SED, MET, NUTR, SO4	NPS SURVEY, 1987	EVALUATED	
KY05100204-013	RED RIVER	55	22	65	11	20	Cl, NUTR, SO4, BACT	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	
KY05100204-014	LULBEGRUD CREEK	11	14	21	23	31	SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100204-015	HARDWICK CREEK	10	20				SED	NPS SURVEY, 1987	EVALUATED	
KY05100204-016	CANE CREEK	11	21	80			SED	NPS SURVEY, 1987	EVALUATED	
KY05100204-018	SOUTH FORK RED RIVER	55					Cl, TDS	DOW-IS, 1985	EVALUATED	WAH
KY05100204-018	SAND LICK FORK	55					Cl, TDS	DOW-IS, 1985	EVALUATED	WAH
KY05100204-019	RED RIVER	70	50	21	80		SED, MET	NPS,1987;DOW-BIO,1987;DOW-AMB,1988-89	MONITORED	WAH
KY05100204-023	STILLWATER CREEK	10	60	65	20		SED, BACT	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100204-025	RED RIVER	70	50	10	60	65	SED, MET, Fe, Mn	NPS,1987;DOW-BIO,1987;DOW-AMB,1988-89	MONITORED	WAH
KY05100204-025	LACY CREEK	10	20	51			SED	NPS SURVEY, 1987	EVALUATED	
KY05100204-025	GILLMORE CREEK	10	20	51	40		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100205-001	KENTUCKY RIVER	11	18	32	40		SED, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-002	WHITES RUN CREEK	11	18	32	40		SED, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-002	MILL CREEK	11	18	14	32	40	SED, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-004	TEN MILE CREEK	80	10	65			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-006	CLARKS CREEK	80	10	65			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-008	GRASSY RUN	80	10	65			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-008	BRUSH CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-010	EAGLE CREEK	11	12	14	22	20	As, SED, OIL-GREASE, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-012	BIG TWIN CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-013	SULPHUR CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-013	DRENNON CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-013	CAINES RUN	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-014	SIX MILE CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-015	SEVERN CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100205-016	SAWRIDGE CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-016	CEDAR CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-017	FLAT CREEK	11	14				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100205-017	MILL CREEK	80	65	10			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-021	CANE RUN CREEK	50	11	12	14	32	MET, SED, NUTR, BACT	NPS SURVEY, 1987; DOW-IS, 1986	MONITORED	WAH

Kentucky River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
KY05100205-026	SOUTH ELKHORN CREEK	40	11	80	32	40	ORGANICS,DO,BACT,MET,LINDANE,SED	NPS SURVEY, 1987; DOW-IS, 1986	MONITORED	WAH, PCR
KY05100205-029	SOUTH ELKHORN CREEK	11	80	32	40		LINDANE, SED, MET, Cl, DDT	NPS SURVEY, 1987	EVALUATED	
KY05100205-031	STONEY CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-032	N. & S. BENSON CREEKS	11	12	14	65		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-033	KENTUCKY RIVER	90	11	14	32	65	BACT, SED, NUTR	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05100205-034	GLENNS CREEK	11	40	80	14		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-035	CLEAR CREEK	11	80	14	20		SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-035	SHAKER CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-036	CRAIG CREEK	11	80	14	20		SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-037	DIX RIVER	11	16	65	32		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-039	CLARKS RUN	62	65	32	14		SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100205-040	SPEARS CREEK	14	32				SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100205-041	DIX RIVER	11	16	65	32		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-042	HARRIS CREEK	11	12	14	13		SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-042	HANGING FORK	11	80	18	65		SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100205-043	DIX RIVER	11	80	18	65	61	SED, NUTR, BACT, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-044	LOGAN CREEK	11	18	90	32		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-047	KENTUCKY RIVER	90	11	40	14	32	BACT, SED, NUTR	NPS SURVEY, 1987; DOW-BIO/AMB, 1988-89	MONITORED	PCR
KY05100205-048	JESSAMINE CREEK	40	30	65			SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-049	HICKMAN CREEK	32	40	64			SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05100205-050	SUGAR CREEK	11	18	22			SED, NUTR, BACT	NPS SURVEY, 1967	EVALUATED	
KY05100205-051	PAINT LICK CREEK	11	16	18	32		SED, BACT	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100205-052	SILVER CREEK	32	65	11	40		PEST, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05100205-053	TATE CREEK	32	65	40	11		SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100205-054	BOONE CREEK	80	14	11	32		SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-055	OTTER CREEK	32	65	40	11		PEST, SED, NUTR	NPS SURVEY, 1987; 305(b),1988	EVALUATED	
KY05100205-056	FOUR MILE CREEK	70					SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-057	UPPER HOWARD CREEK	70	10				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05100205-058	MUDDY CREEK	32	65	66	63		SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05100205-059	ELK LICK	50	70				TDS	DOW-IS, 1989	MONITORED	WAH
KY05100205-059	LOWER HOWARD CREEK	90					SED	NPS SURVEY, 1987	EVALUATED	
KY05100205-059	CANOE CREEK	11	18	22			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	

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	LAKES									
KY05100201-015	CARR FORK LAKE	51	80	65	32		SED, BACT	NPS,1987;305(b),1988;ACOE,1988-89	MONITORED	SCR
KY05100202-003	BUCKHORN LAKE	51	80	21	52	55	SED	NPS,1987;305(b),1988;ACOE/DOW,1988-89	MONITORED	SCR
KY05100205-038	HERRINGTON LAKE	10	65	11	15	32	NUTR, SED, BACT	NPS SURVEY, 1987; DOW-LAKES, 1988-89	MONITORED	WAH
KY05100205-052L01	WILGREEN LAKE	65					NUTR	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	WAH, SCR
	OHIO RIVER *MINOR TRIBUTARIES*									
KY05090203-001	MUD LICK CREEK	40	30	10	60	80	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090203-002	GUNPOWDER CREEK	40	30	10	80	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090203-003	WOOLPER CREEK	40	30	10	80	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05090203-004	STEPHENS CREEK	11	18	32	40		SED, MET	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05090203-004	AGNIELS CREEK	11	18	32	40		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05090203-004	BLACKROCK CREEK	11	18	32	40		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05090203-004	McCOOLS CREEK	11	18	32	40		SED, MET	NPS SURVEY, 1987	EVALUATED	

Upper Cumberland River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	UPPER CUMBERLAND *RIVER BASIN*									
KY05130101-004	SPRUCE CREEK	51	57	55			SO4, SED, MET, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130101-005	LYNN CAMP CREEK	62	63	40			SED, MET, SO4, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130101-009	CUMBERLAND RIVER	90					BACT	DOW-AMB, 1988-89	MONITORED	PCR
KY05130101-010	INDIAN CREEK	30	40				SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130101-011	MARSH CREEK	50	51	55			SED, MET, SO4, Cl	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05130101-011	LAUREL CREEK	30	40				SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130101-012	JELLICO CREEK	51	52	57			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-013	WATTS CREEK	11	13	14	16	18	SO4, SED, MET, NUTR, BACT, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130101-014	BUNCHES CREEK	51	52	57	22		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-016	CANE CREEK	52	57				SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130101-017	LAUREL FORK	51	52	57	80	65	SO4, SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130101-019	CUMBERLAND RIVER	51	80	40			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-020	POPLAR CREEK	51	52	57			SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130101-021	MEADOW CREEK	11	13	14	16	51	SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05130101-022	INDIAN CREEK	51	80				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-023	RICHLAND CREEK	51	80				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-024	L. POPLAR CREEK	51	52	21			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-024	PATTERSON CREEK	51	52	57			SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130101-025	CUMBERLAND RIVER	60	51	80	40		BACT, SED, MET, SO4	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05130101-026	BRUSH CREEK	51	80	21			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-027	STINKING CREEK	51	80	21			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-028	GREASY CREEK	51	21	80			SED	NPS SURVEY, 1987	EVALUATED	
KY05130101-029	L. CLEAR CREEK	51	80				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-030	STRAIGHT CREEK	21	51	65	80		NUTR, BACT, SED	NPS SURVEY, 1987	EVALUATED	
KY05130101-031	CLEAR FORK	50	51	80			SED	NPS,1987;305(b),1988;DOW-IS,1989	MONITORED	WAH
KY05130101-031	YELLOW CREEK	40	51	23	31		ORGANICS,DO,SED,MET,SO4,NUTR,BACT	NPS,1987;305(b),1988;DOW-IS,1989	MONITORED	WAH
KY05130101-031	BENNETTS FORK	50	70				SED	DOW-IS, 1989	MONITORED	WAH
KY05130101-031	LITTLE YELLOW CREEK	50					SED	DOW-IS, 1989	MONITORED	WAH
KY05130101-031	STONY FORK	50	51	21			SED, MET, SO4	NPS SURVEY, 1987; DOW-IS, 1989	MONITORED	WAH

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WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY05130101-032	CUMBERLAND RIVER	60					BACT	DOW-AMB, 1988-89	MONITORED	PCR
KY05130101-033	BROWNIES CREEK	51	21	80	65		SED, MET, SO4, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130101-034	PUCKETT CREEK	80	51	52			SED, MET, SO4, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130101-035	WALLINS CREEK	52	51	80			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-036	POOR FORK	50	52	51	80	21	SED, MET, NUTR, SO4, BACT, Cl	NPS SURVEY, 1987; DOW, pre-1984	EVALUATED	WAH
KY05130101-037	CLOVER FORK	52	51	80	21		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-038	MARTINS FORK	52	51	80			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-038	CRANKS CREEK	50	51	52	80		SED, pH, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130101-038	SLATERS CREEK	57	51	52			SED, MET, SO4	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05130101-038	CATRONS CREEK	52	51	80	21		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130102-001	ROCKCASTLE RIVER	50	20	11	65	80	MET, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130102-002	CANE CREEK	22					SED	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	WAH-THREATENED
KY05130102-003	SINKING CREEK	51	22				MET, BACT, SED	NPS SURVEY, 1987	EVALUATED	
KY05130102-004	SKEGGS CREEK	51	80	65	11		MET, BACT, SED	NPS SURVEY, 1987	EVALUATED	
KY05130102-005	WOOD CREEK	32	14	51	18		SED, BACT, NUTR, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130102-007	ROUNDSTONE CREEK	11	51	65	80		BACT, SED, NUTR, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130102-007	CROOKED CREEK	50					SED	NPS SURVEY, 1987	EVALUATED	
KY05130102-009	HORSE LICK CREEK	20	70	57	80	18	SED, BACT, NUTR, MET, SO4	DOW, pre-1984	EVALUATED	WAH
KY05130102-010	MIDDLE FORK ROCKCASTLE RIVER	80	18	22			BACT, SED, NUTR	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	WAH-THREATENED
KY05130102-011	SOUTH FORK ROCKCASTLE RIVER	51	20	14	11	13	BACT, NUTR, SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130102-011	MOORES CREEK	18	85	80	22		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130102-011	RACCOON CREEK	14	51	63	77	22	SED, BACT, NUTR, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05130102-011	POND CREEK	18	85	80	22		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-001	KETTLE CREEK	11	21	55			SED, Cl	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05130103-002	CUMBERLAND RIVER	11	74	55	77	14	PEST, SED, BACT, SOLID WASTE	NPS SURVEY, 1987	EVALUATED	
KY05130103-003	SULPHUR CREEK	10	20				SED	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR
KY05130103-004	MESHACH CREEK	10	20				SED	NPS SURVEY, 1987	EVALUATED	
KY05130103-005	MARROWBONE CREEK	11	21	14	18	80	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-006	BIG RENOX CREEK	11	14	21	55		PEST, SED, BACT, SOLID WASTE, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130103-007	BEAR CREEK	55	11				SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130103-008	CROCUS CREEK	11	14	13	18	21	PEST, SED, BACT, SOLID WASTE	NPS SURVEY, 1987	EVALUATED	
KY05130103-009	MUDCAMP CREEK	55	21	14			SED, Cl	NPS SURVEY, 1987	EVALUATED	

Upper Cumberland River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
KY05130103-005	McFARLAND CREEK	10	20				SED	NPS SURVEY, 1987	EVALUATED	
KY05130103-012	WOLF CREEK	13	11	14	21	20	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-013	SPUTTER BRANCH	11	80	18	83		NUTR, SED	NPS SURVEY, 1987	EVALUATED	
KY05130103-014	FISHING CREEK	11	13	80	65	16	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-014	ROCK LICK CREEK	11	13	80	16		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-014	COLD WEATHER CREEK	11	80	32	18		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-014	BIG CLIFTY CREEK	11	63	18			NUTR, SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05130103-015	PITMAN CREEK (LOWER)	32	40	83	51		SED, MET, SO4, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130103-015	PITMAN CREEK (UPPER)	11	40	32	18		SED, MET, SO4, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130103-016	CANEY CREEK	11	80	83	18		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-017	OTTER CREEK	11	18	65	85	55	SED, Cl, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130103-018	BEAVER CREEK	40	65	32			SED, NUTR, MET, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130103-020	MEADOW CREEK	11	51	65	85		NUTR, SED	NPS SURVEY, 1987	EVALUATED	
KY05130104-001	BIG SOUTH FORK	50	51	52	57	93	SO4, SED, MET	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	WAH-THREATENED
KY05130104-002	CEDAR SINKING CREEK	11	23	51	55	65	NUTR, BACT, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130104-003	SINKING CREEK	11	23	51	55	65	NUTR, BACT, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130104-004	LITTLE SOUTH FORK	50	11	23	51	55	SED, Cl, TDS, NUTR, BACT	NPS SURVEY, 1987; DOW-IS, 1988-89	MONITORED	WAH
KY05130104-005	WOLF CREEK	51	52	57			SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130104-006	BIG SOUTH FORK	51	52	57	63		SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05130104-007	ROCK CREEK	50	51	52	57		pH, MET, SO4, SED	NPS SURVEY, 1987; DOW-IS, 1988-89	MONITORED	WAH, PCR
KY05130104-008	ROARING PAUNCH CREEK	50	51	52	57		Cl, TDS, SED, SO4, MET, pH	NPS SURVEY, 1987; DOW-IS, 1988-89	MONITORED	WAH
KY05130105-002	SPRING CREEK	14	11	18	13	12	NUTR, BACT, SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05130105-002	SMITH CREEK	14	11	12	13	18	NUTR, BACT, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05130105-003	ILLWILL CREEK	55	21	14	11	13	Cl, TDS, NUTR, BACT, SED	NPS, 1987; DOW & (TN TECH), 1989	MONITORED	WAH-THREATENED
	LAKES									
KY05130101-003	LAUREL RIVER LAKE	90	22	32			SED, NUTR	NPS,1987;305(b),1988;ACOE,1988-89	MONITORED	SCR
KY05130101-006	CORBIN RESERVOIR	90					NUTR	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	DWS, SCR
KY05130101-03BL01	MARTINS FORK LAKE	52	51	30			SED	NPS,1987;305(b),1988;ACOE,pre-1984	EVALUATED	SCR
KY05130101-03BL02	CRANKS CREEK LAKE	50					pH	DOW-LAKES, 1988-89	MONITORED	WAH, PCR

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WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	SALT RIVER BASIN									
KY05140102-002	POND CREEK	40	60	30			AS, MET, Cl, SED	NPS SURVEY, 1987; DOW	MONITORED	
KY05140102-005	SALT RIVER	10	40	32			BACT,MET,ORGANICS,DO,NUTR,SED	NPS SURVEY,1987; DOW-IS/AMB,1988-89	MONITORED	PCR, WAH
KY05140102-006	LONG LICK CREEK	21	32				SED	NPS SURVEY, 1987	EVALUATED	
KY05140102-007	FLOYDS FORK	10	65	40	32	18	SED, BACT, MET, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140102-011	FLOYDS FORK	10	65	32	19	14	MET, SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140102-014	FLOYDS FORK	10	55	32	18	14	MET, SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140102-015	SALT RIVER	10	11	18	32		NUTR,SED,ORGANICS,DO,BACT	NPS SURVEY, 1987; DOW, 1988-89	EVALUATED	WAH
KY05140102-016	KIMBLY RUN	11	14	13			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-016	E. FORK OF COXS CREEK	11	14	18	65		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-016	W. FORK OF COXS CREEK	11	14	18			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-017	PLUM CREEK	11	18	32			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-018	E. FORK SIMPSON CREEK	11	14	18	40		MET, NUTR, SED, BACT	NPS SURVEY, 1987; 305(b), 1988	MONITORED	
KY05140102-019	DUTCHMAN CREEK	11	18	32			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-019	GOOSE CREEK	11	18	32			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-019	ELK CREEK	11	18	32			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-020	BRASHEARS CREEK	11	18	23	32		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-020	BUCK CREEK	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-021	GUIST CREEK	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-022	CLEAR CREEK	11	19	32	40		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-023	FOX RUN	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-023	BULLSKIN CREEK	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-024	SALT RIVER	10					NUTR, ORGANICS, DO	DOW, 1988-89	EVALUATED	WAH
KY05140102-026	BEECH CREEK	11	18	32			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-027	E. PRONG CREEK	11	19	32	14		SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140102-028	JACKS CREEK	11	18	32	14	65	SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05140102-029	TIMBER CREEK	14	11	18			SED, BACT, NUTR	NPS SURVEY, 1987; 305(b), 1988	MONITORED	

Salt River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
KY05140102-030	HAMMONDS CREEK	11	14	32			SED	NPS SURVEY, 1987	EVALUATED	
KY05140102-031	SALT RIVER	11	14	32	12		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140102-033	SALT RIVER	11	14	32	12		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140103-001	ROLLING FORK	10	11	32	14	18	BACT, SED, NUTR	NPS SURVEY, 1987; USGS, 1988-89	MONITORED	WAH
KY05140103-005	ROLLING FORK	10	80	11	76	90	BACT, SED, NUTR	NPS SURVEY,1987; DOW-AMB,1988-89	MONITORED	PCR
KY05140103-006	POTTINGER CREEK	11	14	18			SED, BACT, NUTR	NPS SURVEY, 1987; 305(b), 1988	MONITORED	
KY05140103-007	CLEAR CREEK	11	14	18	62	80	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-007	PANTHER CREEK	11	14	22	20	80	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-007	SALT LICK CREEK	11	90	22	20	90	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-007	OTTER CREEK	11	90				SED	NPS SURVEY, 1987	EVALUATED	
KY05140103-007	THOMPSONS CREEK	11	90				SED	NPS SURVEY, 1987	EVALUATED	
KY05140103-010	BEECH FORK	11	14	18	32		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140103-011	LICK CREEK	11	12	18	14	65	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-014	CARTWRIGHT CREEK	11	14	16	22	20	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-017	LONG LICK CREEK	10	20				SED	NPS SURVEY, 1987	EVALUATED	
KY05140103-019	CHAPLIN RIVER	11	14	18	20		SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140103-020	GLENS CREEK	10	20				SED	NPS SURVEY, 1987	EVALUATED	
KY05140103-021	BEAVER CREEK	14	32	20			SED	NPS SURVEY, 1987	EVALUATED	
KY05140103-023	DRY FK. CHAPLIN RIVER	11	14	12			SED	NPS SURVEY, 1987	EVALUATED	
	LAKES									
KY05140101-004L01	REFORMATORY LAKE	10	16	18			NUTR, DO	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	WAH, SCR
KY05140101-006L01	LAKE JERICHO	10					NUTR	DOW-LAKES, 1988-89	MONITORED	WAH
KY05140102-021L01	GUIST CREEK LAKE	90					NUTR	305(b), 1986; DOW-LAKES, 1989-89	MONITORED	DWS, WAH
KY05140102-022L01	SHELBY LAKE	10					NUTR	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	WAH
KY05140102-025	TAYLORSVILLE LAKE	14	11	18	32	65	SED, NUTR, BACT	NPS, 1987; ACOE 1988-89	MONITORED	WAH
KY05140103-011L01	SYMPSON LAKE	11	14	18	63	65	NUTR	305(b), 1988; DOW-LAKES, 1988-89	MONITORED	DWS

Salt River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	OHIO RIVER									
	MINOR TRIBUTARIES									
KY05140101-001	BIG RUN CREEK	10	30				SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-001	MILL CREEK	30	60	10			SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-002	BEARGRASS CREEK	40	60				SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140101-002	M. FORK BEARGRASS CREEK	40					BACT, ORGANICS, DO	USGS, 1988	MONITORED	PCR, WAH
KY05140101-002	S. FORK BEARGRASS CREEK	40					BACT, ORGANICS, DO	USGS, 1988	MONITORED	PCR, WAH
KY05140101-003	GOOSE CREEK	40	60	30			SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140101-004	HARRODS CREEK	11	14	30			SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-005	PRYOR BRANCH	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-005	CORN CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-006	LITTLE KENTUCKY RIVER	11	14	18	32	40	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140101-006	WHITE SULPHUR FORK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	LOCUST CREEK	11	18	32	40	14	NUTR, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	CAMP CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	GILMORE CREEK	11	18	32	40		SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	SPRING CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	BARE BONE CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	PATTONS CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	MIDDLE CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	EIGHTEEN MILE CREEK	10					SED	NPS SURVEY, 1987	EVALUATED	
KY05140101-007	POND, TAYLOR & BULL CREEK	10					SED	NPS SURVEY, 1987	EVALUATED	
KY05140104-001	SINKING CREEK	11	14	16	21		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140104-004	OTTER CREEK	11	14	16	31	32	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140104-005	TIOGA CREEK	11	14	16	31	32	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140104-005	FRENCH CREEK	11	14	16	31	32	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140104-005	WOLF CREEK	11	14	16	31	32	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140104-005	SPRING CREEK	11	14	16	21	31	SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140104-005	YELLOW BANK CREEK	11	14	16	31	32	SED	NPS SURVEY, 1987	EVALUATED	
KY05140104-005	LICK RUN	11	14	16	21		SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	

Green River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
	GREEN RIVER BASIN									
KY05110001-001	GREEN RIVER	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05110001-002	LITTLE REEDY CREEK	51	70	11	14	22	MET, SO4, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-003	BIG REEDY CREEK	11	16	14	51	77	MET, SO4, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-004	BEAR CREEK	11	16	14	51	13	SO4, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05110001-005	BEAVER DAM CREEK	11	14				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110001-005	ALEXANDER CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05110001-005	LITTLE BEAVER DAM CREEK	11	14				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110001-005	LOST CREEK	10					SED	NPS SURVEY, 1987	EVALUATED	
KY05110001-005	BIG BULL CREEK	51	11	14	22	20	MET, SO4, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-005	LITTLE BULL CREEK	51	11	14	22	20	MET, SO4, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-005	CLAY LICK CREEK	10					SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110001-009	BACON CREEK	10	11	18			BACT, SED, NUTR	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	FCR
KY05110001-010	NOLIN RIVER	11	18	32	21	16	NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-012	VALLEY CREEK	40	11	15	18	32	ORGANICS,DO,Cl,TDS,NUTR,SED,BACT	NPS SURVEY, 1987; DOW-BM, 1988	MONITORED	WAH
KY05110001-013	NOLIN RIVER	11	18	32	21	16	NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-014	MIDDLE CREEK	11	15	18	32	90	NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-016	McDOUGAL CREEK	11	90				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110001-017	WALTERS CREEK	11	90				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110001-018	GREEN RIVER	10	11	14	18	32	BACT, SED, Cl, NUTR	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	FCR
KY05110001-019	LYNN CAMP CREEK	11	18	16	14	21	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-020	LITTLE BARREN RIVER	11	21	18	32	14	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-021	TRAMMEL CREEK	11	14	16	19	65	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-021	GREASY CREEK	11	14	16	18	21	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-024	GREEN RIVER	11	14	16	18	80	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-025	BRUSH CREEK	11	14	16	18	21	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-026	PITMAN CREEK	62	11	64	65	18	BACT, SED	NPS SURVEY, 1987	MONITORED	
KY05110001-026	LITTLE PITMAN CREEK	10	62	11	64	65	Cl, TDS, BACT, SED	NPS SURVEY, 1987; DOW-IS, 1984	MONITORED	WAH
KY05110001-027	RUSSELL CREEK	11	14	16	18	13	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	

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WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY05110001-026	CANEY FORK	14	16	18	65	76	SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05110001-030	RUSSELL CREEK	11	14	16	18	13	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-031	LITTLE RUSSELL CREEK	11	14	16	18	65	SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05110001-032	GREEN RIVER	11	14	16	18	90	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110001-032	MEADOW CREEK	11	18	16	14	65	SED, NUTR, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05110001-034	ROBINSON TALLOW CREEK	11	18	14			SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110001-035	CASEY CREEK	11	13	80	16		SED	NPS SURVEY, 1987	EVALUATED	
KY05110001-037	GREEN RIVER	11	13	18	14	51	SED, NUTR, MET, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110002-001	BARREN RIVER	11	18	14			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110002-002	LITTLE MUDDY CREEK	11	70	14	22	20	SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110002-003	GASPER RIVER	11	14	22	20	16	SED, SOLID WASTE, BACT, MET	NPS SURVEY, 1987	EVALUATED	
KY05110002-004	BARREN RIVER	40	11	18	14		MET, SED, NUTR, BACT	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	WAH
KY05110002-007	WEST FORK DRAKES CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY05110002-008	SULPHUR FORK	11	14	80			SED, PEST	NPS SURVEY, 1987; A.S.C.S.	EVALUATED	
KY05110002-008	MIDDLE FORK DRAKES CREEK	11	62	55	14		SED, BACT	NPS, 1987; DOW; ASCS; HLTH DEPT	EVALUATED	
KY05110002-010	BARREN RIVER	11	18	14			SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110002-011	BAYS FORK	11	56				pH, SED	NPS SURVEY, 1987	EVALUATED	
KY05110002-014	BEAVER CREEK	11	18	32	40		Cl, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05110002-015	SKAGGS CREEK	11	14	16	18	55	Cl, SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05110002-016	PETERS CREEK	11	18				SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110002-019	BARREN RIVER	11	14	22	20		SED	NPS SURVEY, 1987	EVALUATED	
KY05110002-019	PUNCHEON CREEK	10	30				SED	NPS SURVEY, 1987; ASCS	EVALUATED	
KY05110002-019	PINCHGUT CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05110002-019	HUNGRY CREEK	10	80				SED	NPS,1987; 305(b), 1986; ASCS	EVALUATED	
KY05110002-022	E. FORK BARREN RIVER	11	16				SED, NUTR	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110002-022	MILL CREEK	14	23	32	11		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110003-001	GREEN RIVER	51	11	80			SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110003-002	LEWIS CREEK	51	10				SED, MET, pH, SO4, Fe	NPS SURVEY, 1987; DOW, 1981	EVALUATED	
KY05110003-003	POND CREEK	50	51	57	52	11	pH, MET, SED, SO4, Fe	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH, PCR
KY05110003-003	CANEY CREEK	50					pH, MET	DOW-IS, 1981	EVALUATED	WAH, PCR
KY05110003-005	MUD RIVER	11	14	51	18	66	SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110003-008	MUD RIVER	11	14	51	18	56	SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110003-009	GREEN RIVER	40	11	51	14	22	BACT, SED, MET, SO4	NPS SURVEY, 1987; DOW-AMB, 1988-89	MONITORED	PCR

Green River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
KY05110003-010	MUDDY CREEK	11	70	14	51	22	SED, pH, SO4, Fe	NPS SURVEY, 1987; DOW, 1981	EVALUATED	
KY05110003-011	INDIAN CAMP CREEK	70	11	51	14	22	SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110003-012	WELCH CREEK	51	11	70	14	22	SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110003-013	PANTHER CREEK	51	11	14	22	20	SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110004-001	ROUGH RIVER	11	51				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110004-002	BARNETT CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05110004-004	MUDDY CREEK	11	14	51			SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-006	ADAMS FORK	11	14	22			SED	NPS SURVEY, 1987	EVALUATED	
KY05110004-007	HALLS CREEK	11					SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-008	CANEY CREEK	11	16	71			BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110004-010	SHORT CREEK	11	16	71			BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05110004-011	ROCK LICK CREEK	11	14	16	21		SED, NUTR	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-014	FIDDLERS CREEK	11	14	15	21		SED, NUTR	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-015	CLIFTY CREEK	11	16				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-016	MEETING CREEK	11	16	15	18	21	SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-017	LITTLE CLIFTY CREEK	11	16				SED, NUTR	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-017	MUDDY PRONG	11	14	16	21		SED, NUTR	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110004-018	ROUGH CREEK	11	15	21	55		SP COND, SED, pH, Cl	NPS SURVEY, 1987	EVALUATED	
KY05110005-001	GREEN RIVER	55	11				MET, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05110005-003	GREEN RIVER	55	11				MET, SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05110005-004	LICK CREEK	51	11				SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110005-006	PANTHER CREEK	10	70	11	80	14	SED	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05110005-007	W. FORK KNOBLICK CREEK	11	51	14			SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110005-008	RHODES CREEK	11	80				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110005-009	N. FORK PANTHER CREEK	10	70	11	80	14	SED	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05110005-010	S. FORK PANTHER CREEK	10	70	11	80	14	SED	NPS SURVEY, 1987; DFWR, 1987	EVALUATED	WAH
KY05110005-010	TWO MILE CREEK	11	14	30			SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110005-011	GREEN RIVER	55	11	80	13		MET, SED, NUTR, Cl, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110005-012	DEER CREEK	11	90	55	16	74	SED, NUTR, Cl	NPS SURVEY, 1987	EVALUATED	
KY05110005-013	DELEWARE CREEK	11	51	14			SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05110005-013	CASH CREEK	51	11				SED, SO4, MET	NPS SURVEY, 1987	EVALUATED	
KY05110005-015	LONG FALLS CREEK	11	13	14	16	80	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05110005-016	BUCK CREEK	11	13	14	16	51	PEST, SED, BACT	NPS, 1987; HLTH DEPT; ASCS	MONITORED	

Green River Basin -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
KY05110006-001	POND RIVER	50	10	70	51	11	SED, pH, MET, SO4, Fe	NPS,1987; DOW,1981; DOW-AMB,1988-89	MONITORED	WAH
KY05110006-002	CYPRESS CREEK	50	51	13	14	16	pH, SED, NUTR, SO4, BACT, MET	NPS SURVEY, 1987; DOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-002	HARRIS CREEK	50					pH	DOW-IS, 1982	EVALUATED	WAH, PCR
KY05110006-003	OTTER CREEK	80	74	11			SED	NPS SURVEY, 1987	EVALUATED	
KY05110006-004	ELK CREEK	80	74	11			SED	NPS SURVEY, 1987	EVALUATED	
KY05110006-005	FLAT CREEK	50	51	57	11		pH, SED, MET, SO4	NPS SURVEY, 1987; DOW-IS, pre-1984	EVALUATED	WAH, PCR
KY05110006-006	DRAKES CREEK	50	11	51	80	74	pH, SED, SO4, Fe	NPS SURVEY, 1987; DOW-IS, pre-1984	EVALUATED	WAH, PCR
KY05110006-008	W. FORK POND RIVER	11	80	74	51		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05110006-009	POND RIVER	90					MET	DOW-AMB, 1988-89	MONITORED	WAH
KY05110006-013	E. FORK POND RIVER	11	21	80	83	55	SED, Cl	NPS SURVEY, 1987	EVALUATED	
	LAKES									
KY05110001-026L1	CAMPBELLSVILLE RESERVOIR	10					NUTR	305(b), 1988; DOW-LAKES, 1986-89	MONITORED	WAH
KY05110003-007L1	SPA LAKE	10					NUTR	DOW-LAKES, 1986-89	MONITORED	WAH
	OHIO RIVER MINOR TRIBUTARIES									
KY05140201-001	PUP CREEK	11	51	14			SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140201-002	BLACKFORD CREEK	51	11	14	22	16	SED, MET, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140201-003	LEAD CREEK	11	14	22			SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-004	CLOVER CREEK	11	14	22	16	21	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-004	INDIAN CREEK	11	14	22	16	21	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-005	TOWN CREEK	11	14	16	21		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-005	YELLOW CREEK	51	11	14	22		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-005	PANTHER CREEK	11	14	22			SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05140201-005	YELLOW CREEK	40	11	65			SED, BACT	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140201-005	FULKERSON & HORSEMAN DITCH	11	40	32	80		SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	

Lower Cumberland and Tradewater River Basins -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
	LOWER CUMBERLAND *RIVER BASIN*									
KY05130205-002	SANDY CREEK	14	11	30			SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05130205-003	CLAY LICK CREEK	11	14	57	30		BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130205-004	LIVINGSTON CREEK	11	14	16	21	20	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130205-005	RICHLAND CREEK	14	11				SED	NPS SURVEY, 1987	EVALUATED	
KY05130205-005	SUGAR CREEK	51	11	14			SED, pH, SO4, Fe	NPS SURVEY, 1987; DOW 1981	EVALUATED	
KY05130205-005	HICKORY CREEK	11	14	21			SED	NPS SURVEY, 1987	EVALUATED	
KY05130205-007	DRY FORK CREEK	11	16	18	14	21	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130205-008	LITTLE RIVER	10	11	14	16	21	SED, NUTR, BACT, MET	NPS,1987; DOW-IS,1988; DOW-AMB,1988-89	MONITORED	WAH
KY05130205-009	N. FORK LITTLE RIVER	10	11	31	32	80	BACT, SED, NUTR	NPS SURVEY, 1987; DOW-IS, 1988	MONITORED	PCR, WAH
KY05130205-010	S. FORK LITTLE RIVER	10	11	31	32	80	SED, NUTR	NPS SURVEY, 1987; DOW-IS, 1988	MONITORED	WAH
KY05130205-011	SINKING FORK	10	11	14	16	21	SED, NUTR, BACT	NPS SURVEY, 1987; DOW-IS, 1988	MONITORED	WAH
KY05130205-014	MUDDY FORK	11	14	16	21	20	SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05130205-016	SALINE CREEK	11	14	16	21	20	SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-001	MONTGOMERY CREEK	11	31	52	80	21	MET, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-002	ELK FORK	10	11	14	40	80	ORGANICS,DO,MET,BACT,SED,NUTR	NPS SURVEY, 1987; DOW-IS, pre-1984	EVALUATED	WAH
KY05130206-003	RED RIVER	11	16	18			SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-004	WHIPPOORWILL CREEK	11	16	21	80		SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-005	S. FORK RED RIVER	11	16				SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-005	PLEASANT RUN	11	16				SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY05130206-008	SPRING CREEK	11	80	19	21		MET, BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	

Lower Cumberland and Tradewater River Basins -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
	LAKES									
KY05130205-006	BARKLEY LAKE	11	14	16	21	20	SEDIMENT, NUTRIENTS	NPS SURVEY, 1987; ACOE, 1988-89	EVALUATED	
KY05130205-009L02	MORRIS LAKE	90					NUTRIENTS	305(b), 1958; DOW-LAKES, 1988-89	MONITORED	DWS
	TRADEWATER *RIVER BASIN*									
KY05140205-001	TRADEWATER RIVER	50	10	11	30	51	ORGANICS,DO,SED,MET,pH,SO4,SP	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH
KY05140205-002	SMITH DITCH	50	10	11	14	51	pH, SED, NUTR, MET, SO4	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-002	CYPRESS CREEK	50	10				pH, SED	DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-003	CRAB ORCHARD CREEK	50	10	11	51	52	pH, SED, MET, SO4	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-005	TRADEWATER RIVER	50	10	11	74	21	ORGANICS, DO, SED, MET, SO4	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH
KY05140205-006	BUTLER CREEK	10	30				SED	NPS SURVEY, 1987	EVALUATED	
KY05140205-008	CLEAR CREEK	50	10	51	11	55	pH, SED, SO4, SP COND	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-008	LICK CREEK	50	10				pH, SED	DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-008	WEIRS CREEK	50	10				pH, SED	DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-009	TRADEWATER RIVER	50	10	11	74	21	ORGANICS, DO, SED, MET, SO4	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH
KY05140205-010	DONALDSON CREEK	11	21				SED	NPS SURVEY, 1987	EVALUATED	
KY05140205-011	WARD CREEK	11	21				SED	NPS SURVEY, 1987	EVALUATED	
KY05140205-012	TRADEWATER RIVER	50	10	11	74	21	ORGANICS, DO, SED, MET, SO4	NPS SURVEY,1987; DOW-AMB/BIO,1988-89	MONITORED	WAH
KY05140205-013	MONTGOMERY CREEK	11	21				SED	NPS SURVEY, 1987	EVALUATED	
KY05140205-015	CANY CREEK	51	80	74	11		pH, SO4, SP COND	NPS SURVEY, 1987; DOW-IS, 1981	MONITORED	PCR
KY05140205-016	BUFFALO CREEK	50	10	51	80	74	pH, SED, SO4, SP COND	NPS SURVEY, 1987; DOW-IS, 1981	EVALUATED	WAH, PCR
KY05140205-017	SANDLICK CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	

Lower Cumberland and Tradewater River Basins -- NPS Impacted Streams and Lakes (Cont'd)

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED EVALUATED	USES NOT FULLY SUPPORTED
	OHIO RIVER									
	MINOR TRIBUTARIES									
KY05140202-001	LOST CREEK	11	14	55			SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05140202-001	SIBLEY CREEK	77	55				SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05140202-002	HIGHLAND CREEK	11	55	16	14	80	SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05140202-002	HIGHLAND CREEK	11	16	55	14		SED, Cl	NPS SURVEY, 1987	EVALUATED	
KY05140202-006	CANOE CREEK	10	70	40	11	55	SED, Cl	NPS SURVEY, 1987; DFWR, 1997	EVALUATED	WAH
KY05140203-001	SUGARCAMP CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140203-002	DEER CREEK	11	14	57	30		SED, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05140203-003	HURRICANE CREEK	10	30				SED, pH, Fe, SO4	NPS SURVEY, 1987; DOW, 1981	EVALUATED	
KY05140203-003	CANEY FORK	10	30				SED, pH, Fe, SO4	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140203-004	CROOKED CREEK	10	30	40	63		SED, MET	NPS SURVEY, 1987	EVALUATED	
KY05140203-005	EAGLE CREEK	11	14	16			NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140203-006	GOOSE POND DITCH	11	14	72			SED	NPS SURVEY, 1987	EVALUATED	
KY05140203-007	CAMP CREEK	10	30				SED	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY05140203-007	BUCK CREEK	14	11				SED	NPS SURVEY, 1987	EVALUATED	
KY05140203-007	LONG BRANCH	11	14				SED	NPS SURVEY, 1987	EVALUATED	
KY05140203-007	CANEY CREEK	11	14				SED	NPS SURVEY, 1987	EVALUATED	

Tennessee and Mississippi River Basin -- NPS Impacted Streams and Lakes

WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/ EVALUATED	USES NOT FULLY SUPPORTED
	TENNESSEE RIVER BASIN									
KY06040005-004	WILDCAT CREEK	11	14	16	18	21	SED, BACT, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY06040005-004	CLEAR CREEK	11	14	16	18	21	SED, BACT, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY06040006-001	TENNESSEE RIVER	11	14	80	81	32	MET, SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY06040006-002	ISLAND CREEK	11	14	31	32		SED, MET, NUTR, BACT	NPS SURVEY, 1987; 305(b), 1986	EVALUATED	
KY06040006-009	E. FORK CLARKS RIVER	10	11	14	16	18	NUTR, SED, MET, BACT	NPS SURVEY, 1987; DOW-AMB, 1986-89	MONITORED	WAH
KY06040006-011	W. FORK CLARKS RIVER	11	14	16	18	21	SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY06040006-013	JOHNS CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY06040006-013	CYPRESS CREEK	40					PCB	DOW-IS, 1987	MONITORED	WAH
	MISSISSIPPI RIVER BASIN									
KY08010100-001	HAZEL CREEK	11	14	16	80		SED	NPS SURVEY, 1987	EVALUATED	
KY08010100-001	SHAWNEE CREEK	11	14	16	20	40	BACT, SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY08010201-002	TRUMAN CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY08010201-002	BACK SLOUGH CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY08010201-003	W. FORK MAYFIELD CREEK	11	51	18			SED, NUTR, MET	NPS SURVEY, 1987	EVALUATED	
KY08010201-004	MAYFIELD CREEK	10	70	11	14	15	BACT, SED, MET, ORGANICS	NPS SURVEY,1987; DOW-BIO/AMB,1988-89	MONITORED	PCR, WAH-THREATENED
KY08010201-009	MAYFIELD CREEK	10	70	11	14	16	BACT, SED, MET, ORGANICS	NPS SURVEY,1987; DOW-BIO/AMB,1988-89	MONITORED	PCR, WAH-THREATENED
KY08010201-010	OBION CREEK	11	30	18			SED, NUTR	NPS SURVEY, 1987	EVALUATED	
KY08010201-015	KNOBB CREEK	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY08010201-016	OBION CREEK	11	30	18			SED, NUTR	NPS SURVEY, 1987	EVALUATED	

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WATERBODY CODE	STREAM NAME	N.P.S.-CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITORED/EVALUATED	USES NOT FULLY SUPPORTED
KY08010201-017	BRUSH CREEK	11	18				SED, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY08010201-019	BAYOU DE CHIEN	10	70	11	18		BACT, SED, NUTR, ORGANICS	NPS,1987;DOW-BIO,1987;DOW-AMB,1988-89	MONITORED	PCR, WAH-THREATENED
KY08010201-018	RUSH CREEK	11					SED	NPS SURVEY, 1987	EVALUATED	
KY08010201-019	MUD CREEK	11	80	71	72	74	SED, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
KY08010201-019	LITTLE MUD CREEK	11	80	71	72	74	SED	NPS SURVEY, 1987	EVALUATED	
KY08010201-021	CANE CREEK	11	18	90	30		NUTR, SED, BACT	NPS SURVEY, 1987	EVALUATED	
KY08010201-020	LITTLE BAYOU DE CHIEN	11	80				SED	NPS SURVEY, 1987	EVALUATED	
KY08010202-005	TERRAPIN CREEK	11	14	16	18	21	SED, MET, BACT, NUTR	NPS SURVEY, 1987	EVALUATED	
	OHIO RIVER									
	MINOR TRIBUTARIES									
KY05140206-001	HUMPHREY CREEK	10	70				SED	DOW-IS, pre-1984	EVALUATED	WAH
KY05140206-001	HUMPHREY BRANCH	90	10				SED	DOW-IS, pre-1984	EVALUATED	WAH
KY05140206-001	CLAYTON CREEK	11	14	16	20	32	SED, BACT, NUTR, MET, SO4	NPS SURVEY, 1987	EVALUATED	
KY05140206-002	LITTLE BAYOU CREEK	60	11	14	32	40	PCB,SED,MET,NUTR,BACT	NPS SURVEY, 1987; UK, 1989	MONITORED	WAH
KY05140206-002	BAYOU CREEK	11	14	32	40		SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140206-003	MASSAC CREEK	11	14	16	32	40	SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140206-004	PERKINS CREEK	11	14	31	32		SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140206-005	REDSTONE CREEK	11	14	16	20	31	SED, MET, NUTR, BACT	NPS SURVEY, 1987	EVALUATED	
KY05140206-005	NEWTONS CREEK	11	14	16	80		SED, NUTR	NPS SURVEY, 1987	EVALUATED	

Nonpoint Source Impacted Groundwaters

GROUNDWATER WATERBODY NAME	COUNTY ** OR REGION	N.P.S. -- CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITOR EVALUAT
ALLUVIAL AQUIFER NEAR CALVERT CITY	MARSHALL	11	62	63	64	65	MET, VOC, PEST	DOW, 1988a	MONITOR
ALLUVIAL AQUIFER NEAR LOUISVILLE	JEFFERSON	90					ORGANICS	DAVIS AND MATTHEWS, 1983	EVALUAT
AQUIFERS BENEATH THE BIG SINKING OIL FIELD	ESTILL, POWELL, LEE, WOLF	55					pH,SP COND,TDS,Cl,Br,SO4,Na,Ca	SMC MARTIN, 1983	EVALUAT
AQUIFER NEAR RUSSELLVILLE	LOGAN	64	65	61			PCB, MET	HAZTECH, 1985	MONITOR
CENTRAL KENTUCKY KARST REGION	CENTRAL KY KARST REGION	65					BACT	QUINLAN AND ROWE, 1977	EVALUAT
CHLOE CREEK GROUNDWATER BASIN	PIKE	52					ACID	DOW, 1986d	MONITOR
DOUBLE SINK GROUNDWATER BASIN	MAMMOTH CAVE REGION	10	20				SED, PEST	LEITHEUSER, 1988	EVALUAT
GATEWAY A.D.D. AQUIFER	ROWAN,MONTG.,BATH,MENIFEE,MORGAN	11	65				BACT	DOW - KGS, 1988	MONITOR
HIDDEN RIVER GWATER BASIN NEAR HORSE CAVE	HART	64	65				CYANIDE, MET	DOW, 1986d	MONITOR
INNER BLUEGRASS KARST AQUIFERS	ANDERSON, BOYLE, BOURBON, CLARK, FAYETTE,FRANK.,GARRARD,JESS., MADISON,MERCER,SCOTT,WOODFORD	10	40				BACT, NITRATES	SCANLON, 1985	MONITOR
KARSTIC AQUIFER NEAR DRAKES CREEK	SIMPSON	60					PCB	CRAWFORD, 1985	MONITOR
LOST RIVER	WARREN	32	40	61	62	63	ORGANICS, VOC, FUEL	CRAWFORD, 1982 & 1985	MONITOR
LOUISVILLE AQUIFER	JEFFERSON	65					BACT	USEPA, 1981 - 1982	EVALUAT
MAMMOTH CAVE REGION GROUNDWATER BASIN	EDMON.,HART,BARREN,WARREN,GRAYSON	65					BACT	US EPA, 1981	EVALUAT
McCOY BLUE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20	55			SED, PEST, Cl	LEITHEUSER, 1988	EVALUAT
MILL CREEK GROUNDWATER BASIN	JEFFERSON	65					BACT	US EPA, 1982	EVALUAT
NORTH FORK KENTUCKY RIVER GROUNDWATER BASIN	LEE, BREATHITT, PERRY	51					MET, ACID	DYER, 1983	EVALUAT
OHIO VALLEY ALLUVIAL AQUIFER	HANCOCK	60					FLUORIDES, CYANIDE	ENVIR. RESOURCES MGT, 1980	EVALUAT
PIKE SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20				SED, PEST	LEITHEUSER, 1988	EVALUAT
ROYAL SPRING AQUIFER	SCOTT	11	14	16	18	61	BACT	RASS, et al., 1978	EVALUAT
SLOANS VALLEY KARSTIC AQUIFER	PULASKI	61	63	51			MET	FERRY, 1984	EVALUAT
SUDS SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20	55			SED, PEST, Cl	LEITHEUSER, 1986	EVALUAT
TURNHOLE SPRING GROUNDWATER BASIN	MAMMOTH CAVE REGION	10	20				SED, PEST	LEITHEUSER, 1989	EVALUAT
UNNAMED AQUIFER	LIVINGSTON, MARSHALL, McCRACKEN	10	65				BACT, NITRATES	DOW, 1988a	MONITOR
UNNAMED GROUNDWATER BASIN	JOHNSON, MARTIN	52					MET, ACID	MULL, et al., 1981	EVALUAT
UNNAMED GROUNDWATER BASIN	CHRISTIAN	90					BACT	MUENDEL, 1980	EVALUAT
UNNAMED GROUNDWATER BASIN	JEFFERSON	65					BACT	US EPA, 1983	EVALUAT
UNNAMED GROUNDWATER SITE	MAGOFFIN	90						PEAK AND THIERET	EVALUAT
UNNAMED GROUNDWATER SITE	MONTGOMERY	90					OIL-GREASE	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR BOWLING GREEN	WARREN	90					ORGANICS	DOW, 1986d	MONITOR

Nonpoint Source Impacted Groundwaters (Cont'd)

GROUNDWATER WATERBODY NAME	COUNTY ** OR REGION	N.P.S. -- CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITOR EVALUAT
UNNAMED GROUNDWATER SITE NEAR CAMPBELLSVILLE	TAYLOR	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR ELIZABETHTOWN	HARDIN	84					INORGANICS	LAMBERT, 1979	EVALUAT
UNNAMED GROUNDWATER SITE NEAR ELIZABETHTOWN	HARDIN	90					ORGANICS	MULL AND LYVERSE, 1984	EVALUAT
UNNAMED GROUNDWATER SITE NEAR ELIZABETHTOWN	HARDIN	10					NUTR	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR FORT KNOX	HARDIN	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR FRANKFORT	FRANKLIN	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR I-65	HART	88					OIL-GREASE	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR LEXINGTON	FAYETTE	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR LEXINGTON	FAYETTE	90					ORGANICS	FAUST, 1980	EVALUAT
UNNAMED GROUNDWATER SITE NEAR LIGON	FLOYD	90						KY FAIR TAX COALITION,1983	EVALUAT
UNNAMED GROUNDWATER SITE NEAR LOUISVILLE	JEFFERSON	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED GROUNDWATER SITE NEAR PRINCETON	CALDWELL	90					INORGANICS	PLEBUCH, 1976	EVALUAT
UNNAMED - IN DOUBLE SPRINGS DRAINAGE BASIN	WARREN	65					BACT	SCHINDEL, 1984	EVALUAT
UNNAMED KARST AQUIFERS	WARREN,HARDIN,HART,PULASKI,EDMON.	40					ORGANICS	CRAWFORD AND GRAVE, 1984	EVALUAT
UNNAMED SITE NEAR BRUSHY ELEM. SCHOOL	PIKE	90					FUEL	DOW, 1986d	EVALUAT
UNNAMED SPRING GROUNDWATER BASIN	HART, BARREN, EDMONSON	10	20	55			SED, PEST, Cl	LEITHEUSER, 1988	EVALUAT

COUNTY ABBREVIATIONS

EDMON. = EDMONSON
FRANK. = FRANKLIN
JESS. = JESSAMINE
MONTG. = MONTGOMERY

Nonpoint Source Impacted Wetlands

HYDROLOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY **	N.P.S.- CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITO EVALUA
05040202	HENDERSON SLOUGHS	HENDERSON, UNION	11	55				SED, SP COND	BOSSERMAN,1985;MITSCH,1982;NPC,1980b	MONITO
05070201	BEAR CREEK (BIG SANDY)	PIKE	51					SED,pH,MET,SP COND,SO4,Na	NPC, 1979	EVALUA
05070202	ELKHORN CREEK (BIG SANDY)	PIKE	51					SED, SP COND, SO4, MET, Na	NPC, 1979	EVALUA
05070203	JENNY CREEK (BIG SANDY)	JOHNSON	51	52				SP COND, SO4, MET, Na, SED	NPC, 1979	EVALUA
05070203	ROCKCASTLE CREEK (BIG SANDY)	MARTIN	51	52				SED, SP COND, SO4, Na, MET	NPC, 1979	EVALUA
05070203	RIGHT FORK BEAVER C.(BIG SANDY)	FLOYD	51					SP COND, SO4, Na, MET	NPC, 1979	EVALUA
05070203	LEVISA FORK (BIG SANDY)	JOHNSON	51	52				SED,SP COND,SO4,MET,ALKALINITY	NPC, 1979	EVALUA
05070203	SPURLOCK CREEK (BIG SANDY)	FLOYD	51	52	50			SO4, MET, Na, pH, SED	NPC, 1979	EVALUA
05070204	BLAINE CREEK (BIG SANDY)	LAWRENCE	55	51	71			SP COND, METALS, Cl, Na	NPC, 1979	EVALUA
05090104	EAST FORK LITTLE SANDY RIVER	BOYD	51					SP COND, SO4, Na, MET	NPC, 1979	EVALUA
05100101	LICKING RIVER	MAGOFFIN	51	10	16	71		SED, NUTR, SO4, MET, SP COND	NPC, 1979	EVALUA
05100201	BUCKHORN CREEK (KENTUCKY)	BREATHITT	51					MET, SO4, SP COND	NPC, 1979	EVALUA
05100201	TROUBLESOME CREEK (KENTUCKY)	PERRY	51					SP COND, SO4, MET, Na	NPC, 1979	EVALUA
05100201	CARR FORK (KENTUCKY)	KNOTT	51	52				SED, MET, SO4, Na, SP COND	NPC, 1979	EVALUA
05100201	SQUABBLE CREEK (KENTUCKY)	PERRY	51	71	62			SED,SO4,MET,Na,SP COND,BACT,NUTR	NPC, 1979	EVALUA
05100203	GOOSE CREEK (KENTUCKY)	CLAY	51					SEDIMENT	NPC, 1979	EVALUA
05100203	BUCK CREEK (KENTUCKY)	OWSLEY	51	10				SEDIMENT, SO4, METALS	NPC, 1979	EVALUA
05100204	STURGEON CREEK (KENTUCKY)	LEE	51	10				SEDIMENT	NPC, 1979	EVALUA
05110003	DOOLIN LAKE SWAMP	BUTLER	20					SEDIMENT	NPC, 1980b	EVALUA
05110003	MUD RIVER (GREEN)	BUTLER, LOGAN	55					Cl	NPC, 1981	EVALUA
05110003	POND CREEK (GREEN)	OHIO, MUHLENBERG	51	21	23	74		SP COND,pH,SO4,MET,Fe,ACID,SED	MITSCH,1983; NPC,1981; NPC,1980b	EVALUA
05110003	ROCKY CREEK (GREEN)	MUHLENBERG	51					pH, SP COND, SO4	NPC, 1981	EVALUA
05110003	LEWIS CREEK (GREEN)	OHIO, MUHLENBERG	51					pH, SP COND, SO4, TSS, MET	MITSCH, 1983	EVALUA
05110003	LITTLE MUDDY CREEK SWAMP	BUTLER	20					SEDIMENT	NPC, 1980b	EVALUA
05110004	UNNAMED WETLAND - E OF DUNDEE	OHIO	20	74				SEDIMENT	NPC, 1980b	EVALUA
05110004	UNNAMED WETLAND - SW OF DUNDEE	OHIO	70	74	20	51	55	SEDIMENT	NPC, 1980b	EVALUA
05110004	MUDDY CREEK (GREEN)	OHIO	65	51	10	55	20	BACT, pH, SO4, PEST, Cl, SED	NPC, 1981; NPC, 1980b	EVALUA
05110004	ROCK HOUSE SLOUGH (ROUGH)	OHIO	10	74				SEDIMENT	NPC, 1980b	EVALUA
05110005	RICHMOND SLOUGH (GREEN)	DAVIESS, HENDERSON	55	11	14			SEDIMENT, Cl	NPS SURVEY, 1987	EVALUA
05110005	MOSLEYVILLE SLOUGH	DAVIESS	51	71	10			SP COND, SO4, Fe, Mn	DOW, 1981	EVALUA
05110005	UNNAMED SLOUGH - ALONG KY 136	HENDERSON	55					SP COND, Cl	NPC, 1981	EVALUA

Nonpoint Source Impacted Wetlands (Cont'd)

HYDROLOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY **	N.F.S. - CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITOR/EVALUA
05110005	ABE CREEK WETLANDS	McLEAN	20	74	71			SEDIMENT	NPC, 1980b	EVALUAT
05110005	BUCK CREEK SWAMP	McLEAN	10					SEDIMENT	NPC, 1980b	EVALUAT
05110005	PANTHER CREEK WETLANDS	DAVIESS	20	23	10			SEDIMENT	NPC, 1980b	EVALUAT
05110005	LONG FALLS CREEK (GREEN)	McLEAN	51	55	10	71		SP COND, Cl, SO4, SED	NPC, 1980b	EVALUAT
05110006	LITTLE CYPRESS CREEK (GREEN)	OHIO	51	52	57			SP COND, SO4, Fe, Mn	MITSCH, 1983	EVALUAT
05110006	DEER CREEK (GREEN)	WEBSTER	10	55	71	80		METALS, SOLID WASTE	DOW, 1981; NPC, 1980b	EVALUAT
05110006	THOMPSON CREEK (GREEN)	MUHLENBERG	51	57				SP COND, SO4	MITSCH, 1983	EVALUAT
05110006	LONG POND (GREEN)	MUHLENBERG, HOPKINS	11	76				SEDIMENT	NPC, 1980; DOW, 1989	EVALUAT
05110006	FLAT CREEK WETLANDS	HOPKINS	50					SP COND, SO4	NPC, 1980b	EVALUAT
05110006	ROUGH RIVER (GREEN)	OHIO	51					SO4	NPC, 1981	EVALUAT
05110006	LONG POND (GREEN)	CHRISTIAN	51	52	57			SP COND, MET	MITSCH, 1983; NPC, 1981	EVALUAT
05110006	WEST FORK POND RIVER (GREEN)	CHRISTIAN	51	57	74	20		SP COND, SO4, ALKALINITY, SED	MITSCH,1983; NPC,1981; NPC,1980b	EVALUAT
05110006	FLAT CREEK (GREEN)	HOPKINS	51	52	57			SO4, SP COND, pH	MITSCH, 1983; NPC, 1981	EVALUAT
05110006	DRAKES CREEK (GREEN)	CHRISTIAN	51	52	57			pH, Fe, SO4	MITSCH, 1983	EVALUAT
05110006	POND RIVER WETLANDS	CHRIS., McLEAN, MUHLEN	10	20	55			SEDIMENT	NPC, 1980b	EVALUAT
05110006	CYPRESS CREEK (GREEN)	McLEAN, MUHLENBERG	51	71	73	11	77	TSS,SO4,pH,SP COND,Mn,Fe,ACID,SED	MITSCH,1982 & 1985; BOSSERMAN,1985	MONITOR
05130101	ROAD FORK CREEK (UP. CUMBER.)	KNOX	10	16	51			NUTRIENTS, SEDIMENT	NPC, 1979	EVALUAT
05130101	CRANKS CREEK (UPPER CUMBERLAND)	HARLAN	51					pH, SP COND, MET, SO4, TSS	NPC, 1979	EVALUAT
05130101	LAUREL RIVER (UPPER CUMBERLAND)	LAUREL	50					SP COND, SO4, MET	NPC, 1980a	EVALUAT
05130101	COLLIERS CREEK (UP. CUMBER.)	LETCHER	52					SED, MET, SP COND, ALKALINITY, Na	NPC, 1979; NPC, 1980a	EVALUATE
05130101	MARSH CREEK (UPPER CUMBERLAND)	McCREARY	51	52	10			pH, METALS, SEDIMENT	NPC, 1980a	EVALUAT
05130101	CLEAR FORK (UPPER CUMBERLAND)	BELL	51	10				SED, SO4, MET, SP COND	NPC, 1979	EVALUAT
05130101	BIG INDIAN CREEK (UP. CUMBER.)	KNOX	51	10	16			SED, SO4, MET, Na, SP COND, NUTR	NPC, 1979	EVALUATE
05130104	BIG SOUTH FORK (UP. CUMBERLAND)	McCREARY	51					SEDIMENT, pH, SO4	NPC, 1980a	EVALUAT
05130104	KENNEDY CREEK (UP. CUMBERLAND)	WAYNE	55					Cl, Na	NPC, 1980a	EVALUATE
05130104	LITTLE SOUTH FORK (UP. CUMBER.)	WAYNE	55					TDS, SP COND, Cl	NPC, 1980a	EVALUATE
05140202	OHIO RIVER WETLANDS	UNION	11					SEDIMENT	NPC, 1980b	EVALUATE
05140202	UNNAMED SLOUGH - OHIO RIVER	HENDERSON	55					SPECIFIC CONDUCTANCE	NPC, 1980b	EVALUATE
05140202	GRASSY POND WETLANDS	HENDERSON	77	72	55			SEDIMENT, Cl	NPS SURVEY, 1987	EVALUATE
05140202	LITTLE CYPRESS SLOUGH	HENDERSON	77	72	55			SEDIMENT, Cl	NPS SURVEY, 1987	EVALUATE
05140205	TRADEWATER RIPARIAN WETLANDS	CRITTENDEN	11					SEDIMENT	NPC, 1980b	EVALUATE
05140205	CANY CREEK (TRADEWATER & GREEN)	HOPKINS	51	52	57			ACIDITY, SO4, MET	MITSCH, 1983	EVALUATE

Nonpoint Source Impacted Wetlands (Cont'd)

HYDROLOGIC CODE	WETLANDS NAME (RIVER BASIN)	COUNTY **	N.P.S.- CATEGORIES 1	2	3	4	5	PARAMETERS OF CONCERN	DATA SOURCES	MONITOR EVALUAT
05140205	WEIRS CREEK (TRADEWATER)	HOPKINS	51	52	57	74		SED, SO4, Fe, ACID, SP COND	MITSCH,1983; NPC,1981; NPC,1980b	EVALUAT
05140205	CLEAR CREEK SWAMP (TRADEWATER)	HOPKINS	51	70	21	74		SED, pH, SO4, Fe, SP COND, Mn	MITSCH,1982 & 1985; BOSSERMAN,1985	MONITOR
05140205	PROVIDENCE (TRADEWATER)	WEB., CRITT., HOPK.	51	52	57			SED, Mn, SO4, Al, SP COND	MITSCH, 1983	EVALUAT
05140205	OLNEY (TRADEWATER)	CALDWELL, HOPKINS	51	52	57			SED, pH, MET	MITSCH, 1983; NPC, 1981	EVALUAT
05140205	MONTGOMERY CREEK (TRADEWATER)	HOPK., CALD., CHRIS.	65	10	50			SED	MITSCH, 1983; NPC, 1981	EVALUAT
05140205	LICK CREEK (TRADEWATER)	CALD.,HOPK.,CRITT.,WEB	51	52	57	21	23	pH, SO4, Fe, SED	MITSCH, 1983; NPC, 1980b	EVALUAT
05140205	BROOKS CREEK (TRADEWATER)	CALD.,HOPK.,CRITT.,WEB	51	52	57			SO4, SP COND, SED	MITSCH, 1983	EVALUAT
05140205	LAND BRANCH WETLANDS	CALDWELL	50	20	74			SED	NPC, 1980b	EVALUAT
05140205	UNNAMED (HURRICANE/TRADEWATER)	HOPK.,CALD., CHRIS.	51					pH, DO, Fe	MITSCH, 1983	EVALUAT
08010100	BURNT SLOUGH CREEK	BALLARD	11					SED	DOW, 1989	EVALUAT
08010201	BAYOU DE CHEIN WETLANDS	FULTON, HICKMAN, GRAV.	11	18				SED, NUTR, BACT	DOW, 1989	EVALUAT
08010201	OBION CREEK WETLANDS	CARLISLE, HICK., GRAV.	11	30	18			SED, NUTR	DOW, 1989	EVALUAT
08010201	WEST FORK MAYFIELD C. WETLANDS	GRAVES	11	51	18			SED, NUTR, MET	DOW, 1989	EVALUAT
08010201	MAYFIELD CREEK WETLANDS	CALLOWAY, GRAVES	11	14	16	18	20	SED, BACT, MET	DOW, 1989	EVALUAT
08010201	LITTLE BAYOU DE CHEIN WETLANDS	FULTON	11					SED	DOW, 1989	EVALUAT
08010202	OWENS SLOUGH	FULTON	11	14	22			SED	NPS SURVEY, 1987	EVALUAT
08010202	RUNNING SLOUGH	FULTON	11					SED, NUTR	USFW, 1988	EVALUAT

** COUNTY ABBREVIATIONS **

CALD. = CALDWELL
CHRIS. = CHRISTIAN
CRITT. = CRITTENDEN
GRAV. = GRAVES
HICK. = HICKMAN
HOPK. = HOPKINS
MUHLEN. = MUHLENBURG
WEB. = WEBSTER

Nonpoint Source Category Codes

10 Agriculture
- 11 Non-irrigated crop production
- 12 Irrigated crop production
- 13 Specialty crop production (e.g., truck farming and orchards)
- 14 Pasture land
- 15 Range land
- 16 Feedlot - all types
- 17 Aquaculture
- 18 Animal management areas
- 19 Manure lagoons

20 Silviculture
- 21 Harvesting-reforestation
- 22 Forest managment
- 23 Road construction

30 Construction
- 31 Highway - road - bridge
- 32 Land development

40 Runoff/Storm Sewers
(Includes runoff from residential, commercial, industrial, and park-land areas not covered under other source categories)

50 Resource Extraction
- 51 Surface mining
- 52 Subsurface mining
- 53 Placer mining
- 54 Dredge mining
- 55 Petroleum activities
- 56 Mill tailings
- 57 Mine tailings

60 Land Disposal
- 61 Sludge
- 62 Wastewater
- 63 Landfills
- 64 Industrial land treatment
- 65 Onsite wastewater systems (septic tanks, etc.)
- 66 Hazardous waste

70 Hydrologic - Habitat Modification
- 71 Channelization
- 72 Dredging
- 73 Dam construction
- 74 Flow regulation
- 75 Bridge construction
- 76 Vegetation removal
- 77 Streambank modification - destabilization
- 78 Draining - filling of wetlands

80 Other
- 81 Atmospheric deposition
- 82 Waste storage - storage tank leaks
- 83 Highway runoff
- 84 Spills
- 85 In-place contaminants
- 86 Natural
- 87 Recreational activities
- 88 Upstream impoundments
- 89 Salt storage sites

90 Unknown

Parameter Abbreviations

Parameters	Abbreviations or Notation
Agriculture	
Total Suspended Solids	SUSPENDED SOLIDS, TSS
Sediment	SED, SEDIMENT
Pesticides	PEST
Lindane	LINDANE
Dichloro-diphenyl-trichloroethane	DDT
Nutrients (ammonia, phosphorus)	NUTR
Bacteria	BACT
Dissolved oxygen	DO
Nitrates	NITRATES
Mining	
Acidity	ACID
Manganese	Mn
Sulfates	SO_4
Aluminum	Al
Metals	MET
Iron	IRON, Fe
pH	pH
Alkalinity	ALKALINITY
Specific Conductance	SP COND
Petroleum	
Chlorides	Cl
Total organic carbon	TOC
Urban	
Oil-grease	OIL-GREASE
Arsenic	As
Solid waste	SOLID WASTE
Polychlorinated-biphenyls	PCB
Total dissolved solids	TDS
Bromide	Br
Sodium	Na
Calcium	Ca
Volatile organic compounds	VOC
Organics	ORGANICS
Fluorides	FLUORIDES
Cyanide	CYANIDE
Fuel (Gasoline, Diesel)	FUEL
Inorganics	INORGANICS